Geological Survey of Canada
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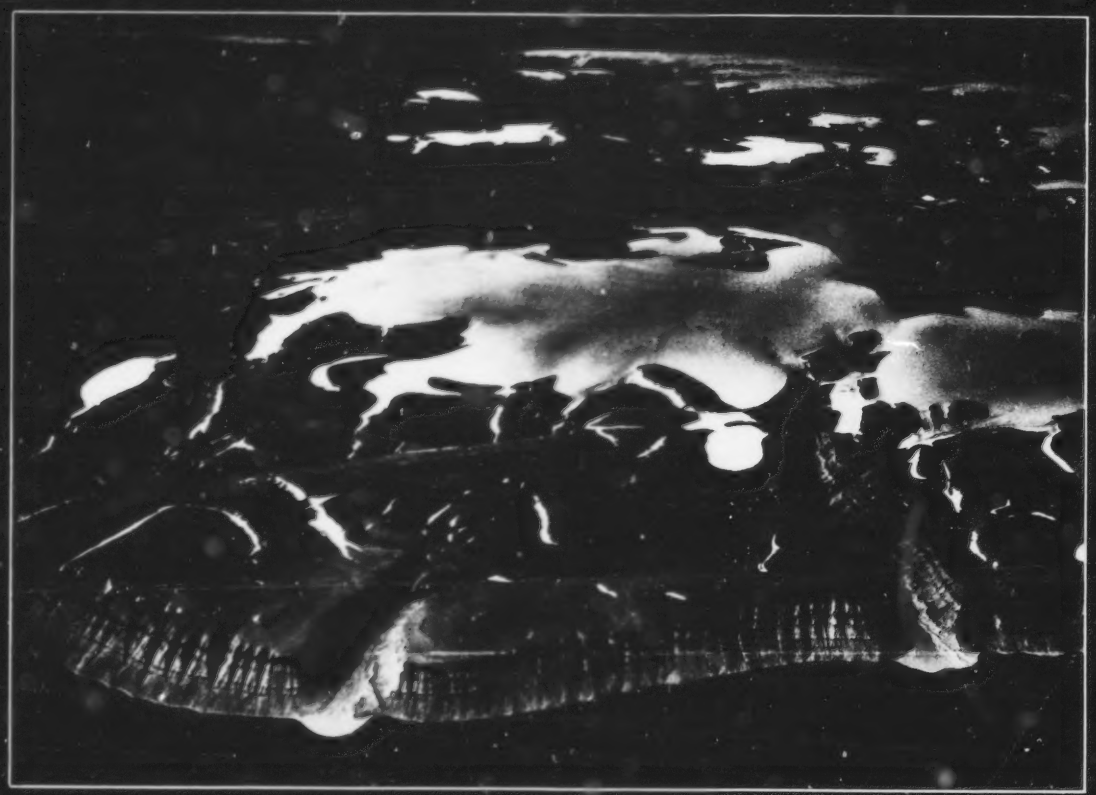
MEMOIR 411

THE SEDIMENTARY ROCKS OF DEVON ISLAND, CANADIAN ARCTIC ARCHIPELAGO



R. THORSTEINSSON
U. MAYR

1987

Canada

87-03871/

GEOLOGICAL SURVEY OF CANADA
MEMOIR 411

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Available in Canada through

authorized bookstore agents and other bookstores

or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Ottawa, Canada K1A 0S9

and from

Geological Survey of Canada offices:

601 Booth Street
Ottawa, Canada K1A 0E8

3303-33rd Street N.W.,
Calgary, Alberta T2L 2A7

A deposit copy of this publication is also available
for reference in public libraries across Canada

Cat. No. M46-411E Canada: $25.00
ISBN 0-660-12319-3 Other countries: $30.00

Price subject to change without notice

See Frontispiece for cover photo description.

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Original manuscript submitted: 1982-05-25
Approved for publication: 1986-09-30

PREFACE

Devon Island is situated on the east side of Baffin Bay and constitutes the fourth largest island in the Canadian Arctic Archipelago. This island is notable for: spectacular sea cliffs and deep fiords; flat-topped uplands that represent an old erosion surface, now tilted from east to west; a small ice-cap that occupies the high, eastern part of the island; and a well displayed, rather large meteorite crater.

The report deals with the main southern part of Devon Island situated between Jones Sound to the north and Lancaster Sound to the south. Two major geological provinces are included in this region: the Canadian Shield, consisting mainly of crystalline rocks, and outcropping in easternmost parts of the island; and the Arctic Platform exposed to the west, and made up mainly of Phanerozoic sedimentary rocks. This report is concerned only with the platform rocks that consist almost entirely of gently dipping Cambrian to Devonian sediments. Although there is no record of Carboniferous to Jurassic sediments, small outcrop areas of formations that range from Cretaceous to Early Tertiary in age are preserved here and there in grabens in the lower Paleozoic terrain.

This report, which covers an area of about 31 600 km^2, represents the first comprehensive account of the region. It is based on field and laboratory studies carried out from 1973 to 1980.

Regional geological studies and geological maps, as presented in this Memoir, constitute an essential scientific base upon which resource industries formulate exploration programs to search for new fuel and mineral resources. In addition, they provide the data for estimating the potential abundance and probable distribution of these resources in the nation. They also contribute to the body of knowledge that comprises the science of geology.

R.A. Price
Director General
Geological Survey of Canada

PRÉFACE

L'île Devon, située du côté est de la baie de Baffin, constitue la quatrième plus grande île de l'archipel Arctique canadien. Cette île se distingue par ses falaises littorales spectaculaires et ses fjords profonds; ses hautes-terres à sommet plat, vestiges d'une ancienne surface d'érosion maintenant inclinée d'est en ouest; une petite calotte glaciaire qui couvre la partie élevée de l'est de l'île; et un assez gros cratère météorique aux contours parfaitement nets.

Le présent rapport porte sur la partie sud principale de l'île Devon, située entre le détroit de Jones, au nord, et le détroit de Lancaster, au sud. Deux importantes provinces géologiques sont comprises dans cette région, soit le Bouclier canadien, comportant surtout des roches cristallines et affleurant à l'extrémité est de l'île, et la plate-forme de l'Arctique, exposée à l'ouest et formée principalement de roches sédimentaires du Phanérozoïque. Le rapport traite seulement des roches de la plate-forme composée presque uniquement de formations sédimentaires à faible pendage dont l'âge varie du Cambrien au Dévonien. Bien que l'on n'ait pas relevé de sédiments datant du Carbonifère au Jurassique, de petits affleurements de formations datant du Crétacé au Tertiaire inférieur existent toujours par endroits dans les fossés observés dans le terrain paléozoïque.

Il s'agit ici du premier compte rendu détaillé de la géologie de cette région qui couvre une superficie de quelques 31 600 km^2. Le rapport est fondé sur les résultats d'études exécutées sur le terrain et en laboratoire de 1973 à 1980.

Les résultats des études géologiques régionales et les cartes géologiques qu'il contient fournissent la base scientifique indispensable à partir de laquelle les industries axées sur les ressources élaborent des programmes d'exploration visant la découverte de nouvelles ressources en minéraux et en combustibles. En outre, ils fournissent les données permettant d'estimer la quantité éventuelle et la répartition probable de ces ressources au Canada. Ils représentent également un apport à la masse de connaissance dont fait partie le domaine de la géologie.

R.A. Price
Directeur général
Commission géologique du Canada

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Figure 1. Oblique aerial photograph, looking west over the south coast of eastern Devon Island. Powell Inlet is in foreground with Burnett and Stratton inlets in background. The photograph well illustrates many of the geological and physiographical characteristics of eastern Devon Island, as described in the text. For identification of map units and structures see Map 1612A, **Powell Inlet,** *in pocket.*

THE SEDIMENTARY ROCKS OF DEVON ISLAND, CANADIAN ARCTIC ARCHIPELAGO

Abstract

The present study deals mainly with the stratigraphy, structural geology and environment of deposition of the strata of the Arctic Platform, comprising mainly a structurally concordant succession of lower Paleozoic strata in the western three quarters of the island. The Paleozoic strata comprise, for the most part, a westerly dipping homocline.

The greater part of the sedimentary column, in terms of age span and volume of sediments, is made up of Lower Cambrian to Lower Devonian strata. However, strata of Proterozoic, Mesozoic and Cenozoic ages are represented also. The column is divisible into three structurally conformable successions that are separated from one another by regional unconformities, and a fourth succession that includes two unnamed formations in the Haughton impact crater:

1. The Proterozoic is represented by a single formation consisting mainly of sandstone and siltstone. Outcrops are limited to a small area on the south coast where the formation lies nonconformably on Precambrian crystalline rocks, and is overlain unconformably by Cambrian strata.

2. The Paleozoic sediments consist mainly of shelf-type carbonate strata. They are divisible into fifteen formations with a total exposed thickness of about 3700 m. Most formations maintain relatively uniform characteristics throughout the report area. However, the three youngest formations, which outcrop in extreme western parts of the island, exhibit noteworthy facies relationships, with two shelf-type carbonate formations in southern parts of the island giving place laterally to graptolitic rocks in the north. Unconformities occur within the Paleozoic succession: between Lower and Middle Cambrian rocks; and probably between rocks of Late Ordovician and Early Silurian ages.

3. Three easily weathered formations are preserved in a series of grabens developed in the Paleozoic terrane of western Devon Island. They are: 1. the Hassel Formation, nonmarine sandstone, Albian to Cenomanian; 2. the Kanguk Formation, marine shale, Turonian to Campanian; 3. the Eureka Sound Formation, mainly nonmarine sandstone, Maastrichtian.

4. The older of two formations within the limits of the Haughton crater consists of impact breccia. The younger consists of lake sediments.

Devon Island is cut by numerous, steeply-dipping, normal faults.

Key words: Stratigraphy, structural geology, environment of deposition, Phanerozoic rocks, Devon Island, Arctic Canada.

Résumé

La présente étude fait état principalement de la stratigraphie, de la géologie structurale et du milieu de sédimentation des strates de la plate-forme de l'Arctique; cette dernière est constituée essentiellement d'une séquence structuralement concordante de couches du Paléozoique inférieur dans les trois quarts ouest de l'île. Les couches paléozoïques présentent, pour la plupart, une forme homoclinale à pendage ouest.

La majeure partie de la colonne sédimentaire, en fonction de la période géologique et du volume des sédiments, se compose de couches dont l'âge s'étend du Cambrien inférieur au Dévonien inférieur. Cependant, le Protérozoïque, le Mésozoïque et le Cénozoique y sont également représentés. La colonne peut être divisée en trois séquences caractérisées par une concordance structurale et séparées les unes des autres par des discordances régionales, auxquelles vient s'ajouter une quatrième séquence qui comprend deux formations sans noms observées dans le cratère météorique de Haughton:

1. Le Protérozoïque est représenté par une seule formation, constituée essentiellement de grès et de microgrès. Cette formation n'affleure qu'à quelques endroits sur la côte sud où, à la fois, elle recouvre de façon discordante des roches cristallines du Précambrien et repose, également en discordance, sous des couches du Cambrien.

2. Les sédiments paléozoïques comprennent essentiellement des couches de carbonate du genre de celles retrouvées dans un milieu de plate-forme. On peut les diviser en formations dont les affleurements observés atteignent une épaisseur totale d'environ 3700 m. La plupart d'entre elles conservent des caractéristiques assez uniformes sur toute l'étendue qui fait l'objet du rapport. Cependant, dans les trois formations les plus récentes qui affleurent à certains endroits de l'extrémité ouest de l'île, on observe des rapports de faciès remarquables, soit deux formations de carbonate du genre susmentionné dans le sud de l'île faisant place latéralement à des roches graptolitiques dans le nord. Des zones de discordance se rencontrent à l'intérieur de la séquence paléozoïque, entre le Cambrien inférieur et le Cambrien moyen et, probablement, entre l'Ordovicien supérieur et le Silurien inférieur.

3. Trois formations facilement altérées sont conservées dans une série de grabens qui se sont formés dans le terrain paléozoïque de la partie ouest de l'île Devon. Il s'agit de 1) la formation de Hassel, constituée de grès non-marin et s'étendant de l'Albien au Cénomanien; 2) la formation de Kanguk, constituée de schiste argileux marin et s'étendant du Turonien au Campanien; et, 3) la formation d'Eureka Sound, constituée essentiellement de grès non-marin et datant du Maastrichtien.

4. Des deux formations observées à l'intérieur des limites du cratère de Haughton, la plus ancienne est constituée d'impactite, et la plus récente, de sédiments lacustres.

L'île Devon est entaillée par de nombreuses failles normales à pendage raide.

Mots clés: Stratigraphie, géologie structurale, milieu de déposition, roches phanérozoïques, île Devon, Arctique canadien.

CHAPTER I

INTRODUCTION

Location and scope of study

Devon Island is situated in the eastern part of the Canadian Arctic Archipelago (Fig. 2). It encompasses an area of about 66 800 square kilometres (25 800 sq. miles), and is the fourth largest island in the archipelago. Geographically, Devon Island may be subdivided into four parts: a roughly rectangular-shaped landmass with its long axis lying more or less along latitute 75°00'N, and comprising by far the greater part of the island; and a series of three smaller, irregularly shaped landmasses extending northwesterly from the northwestern corner of the main mass of the island and nearly separated from one another by deep fiords. Two of these smaller landmasses are distinguished by names – Colin Archer Peninsula and Grinnell Peninsula.

The present account deals with the rectangular-shaped, main part of Devon Island which is bordered by four major seaways: Wellington Channel to the west; Jones Sound to the north; Baffin Bay to the east; and Lancaster Sound – the principal access route to the archipelago – to the south. Except for the section in this chapter that describes the early exploration of the island, the name Devon Island, as employed in the present account, refers only to the main part of the island.

The account makes available reconnaissance stratigraphic and structural studies of those parts of Devon Island underlain by Proterozoic and Phanerozoic sedimentary rocks. It does not include a study of the Precambrian crystalline rocks that are exposed extensively in eastern parts of the island, and which are currently being studied by Dr. T. Frisch of the Geological Survey of Canada. The report area spans about one and a half degrees of latitude (74°27'N to 76°00'N) and almost twelve degrees of longitude (82°00'W to 93°95'W), and encompasses about 31 600 square kilometres (12 200 sq. miles).

The geology of the report area is illustrated on five geological maps at a scale of 1:250 000 (in pocket). The maps include *Dundas Harbour* (1616A), *Powell Inlet* (1612A), *Bear Bay East* (1613A), *Maxwell Bay* (1615A) and *Bear Bay West* (1614A). The geological maps are based on 1:250 000 topographic sheets published by the Surveys and Mapping Branch, with modifications to sheet boundaries as indicated on the indices of specific maps. For purposes of convenience, the names of the geological maps referred to throughout the present account are given in italics.

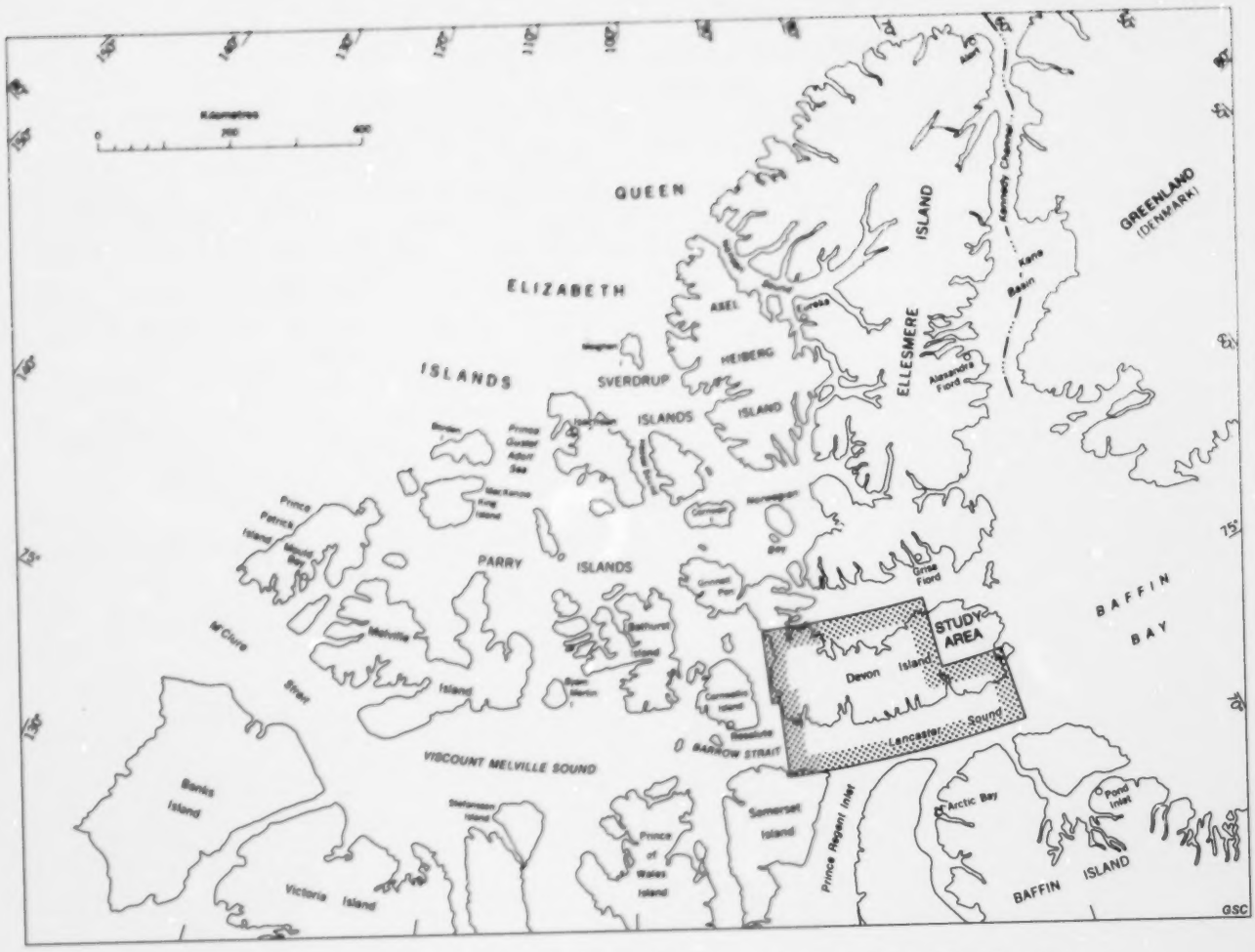

Figure 2. *Index map of the Canadian Arctic Archipelago, showing location of study area.*

Accessibility and settlement

There is no permanent settlement on Devon Island. The island is most readily accessible from Resolute on Cornwallis Island by means of helicopter and fixed-wing aircraft capable of landing on unprepared terrain; both types of aircraft are available under charter at Resolute. Resolute consists principally of an airport operated by the Ministry of Transport, and has a gravel airstrip that is serviceable throughout the year. Resolute is also accessible by ship during a part of the summer and fall, and it serves as the main logistics centre for both governmental agencies and commercial companies operating in the islands of the archipelago that lie north of Parry Channel, as well as in the northern regions of some of the islands south of the channel. Resolute is about 85 km from the closest part of Devon Island.

A Royal Canadian Mounted Police post was established at Dundas Harbour in 1924, and maintained until 1933, at which time it was closed. It was reopened in 1946, but closed for the last time in 1951. During these periods, several notable patrols were made into various parts of the archipelago by members of the Dundas Harbour detachment. In 1934, the Hudson's Bay Company established a trading post at Dundas Harbour. The manager of this post was C. Russell (1978), who was assisted by a clerk whose name was T. Harwood. Ten families of Eskimo from Baffin Island accompanied Russell to Dundas Harbour in order to trap white fox. The post was closed in 1936, at which time the Eskimos returned to Baffin Island.

History of exploration

Devon Island was first visited by William Baffin in 1616, and although it was not named by him, he did name Jones Sound and Lancaster Sound, both of which he thought were bays. Baffin's discoveries were largely ignored, or completely discredited until vindicated in 1818 by Commander John Ross (1819), who was sent out by the British Admiralty to search for a Northwest Passage. Ross commanded HMS *Isabella* and *Alexander*, and following Baffin's route, he proceeded up the west coast of Greenland.

At the north end of Baffin Bay, Ross crossed over the mouth of Smith Sound to near the southeastern extremity of Ellesmere Island. From there he turned southwesterly, crossing the mouth of Jones Sound, and then continued on to Lancaster Sound, which he penetrated for some 30 km. Unfortunately, Ross repeated Baffin's error when he concluded that all three northern outlets to Baffin Bay (i.e. Smith, Jones and Lancaster sounds) were bays. Ross made no landings on Devon Island, but he mapped the east coast of the island, naming some of the more prominent headlands and bays, including the Cunningham Mountains.

The following year (1819), Captain W.E. Parry (1821), who had served as Ross's second-in-command and captain of the *Alexander*, was sent out by the Admiralty with explicit instructions to investigate Lancaster Sound as a possible route to the Pacific Ocean. Parry commanded the *Hecla* and the *Griper*. This was the first of three expeditions that Parry was to lead into the Canadian Arctic Archipelago and, in terms of geographical discoveries, one of the most successful expeditions to enter the region. Sailing west through Lancaster Sound, Parry charted the entire south coast of Devon Island, which he named North Devon (modern usage has dropped the "North") and named most of the prominent headlands and bays along this stretch of coast. A landing was made at Beechey Island, a small tide-island at the southwestern extremity of Devon Island, which was to become one of the most historic spots in the archipelago. Continuing his westerly course from Beechey Island, Parry reached Melville Island after discovering and naming most of the islands along his route. Finding his westward progress blocked by ice, Parry wintered his two vessels in Winter Harbour on the south coast of Melville Island, and returned to England the following summer.

Following Parry's expedition of 1819-1820, almost every expedition to enter the archipelago from the east passed along the south coast of Devon Island, and most visited Beechey Island. Only those expeditions that contributed substantively to completing the charting of the island, or to its historical significance are dealt with in the following discussions.

Sir John Franklin's tragic third expedition to the Arctic passed its first winter (1845-1846) at Beechey Island. There, three members of Franklin's crew died and were buried on land. Although it is probable that Franklin charted a large part of the west coast of Devon Island, no record of this has been found.

Traces of Franklin's wintering at Beechey Island were discovered in August, 1850 by Captain H.T. Austin (British Parliamentary Papers, 1852), commander of one of the Franklin search expeditions sent out by the British Admiralty. Austin commanded the sailing vessels *Assistance* and *Resolute*, and the steam tenders *Intrepid* and *Pioneer*. After leaving Beechey Island, Austin's squadron sailed into Barrow Strait and took up winter quarters between Cornwallis and Griffith islands. William Penny, a whaling captain, was in charge of another British Admiralty squadron that arrived at Beechey Island at about the same time as Austin (Sutherland, 1852; British Parliamentary Papers, 1852). Penny was in command of the *Lady Franklin* and the *Sophia*, and he passed the winter of 1850-1851 in Assistance Bay on the south coast of Cornwallis Island, in company with a privately financed expedition led by Sir John Ross, commander of the *Felix*.

In the spring of 1851, sledging parties from Penny's squadron charted the west coast of Devon Island from Beechey Island to Cape Becher on Grinnell Peninsula.

An American-sponsored search expedition under Lieutenant E.J. De Haven, (Kane, 1854), sailing in the *Advance* and *Rescue*, accompanied Austin and Penny's squadrons as far west as Cornwallis Island. Proceeding homeward in September, 1850, De Haven's ships were beset by ice in Wellington Channel, where they passed part of the winter before drifting out into Baffin Bay in the spring. At the most northerly point attained in Wellington Channel, De Haven claimed to have seen and named Grinnell Peninsula.

After fruitless searching for further traces of Franklin's expedition, Austin, Penny and Ross returned to England in 1851. In 1852, the largest and last of the British Admiralty search expeditions arrived at Beechey Island with five ships under the command of Captain Sir Edward Belcher (1855; British Parliamentary Papers, 1855). Sending the *Resolute* and *Intrepid* west to Melville Island under the command of Captain H. Kellet, Belcher, with the *Assistance* and *Pioneer*, proceeded north through Wellington Channel and thence on to Penny Strait, where he was stopped by ice and decided to winter in Northumberland Sound, on the west coast of Grinnell Peninsula. The fifth ship, the *North Star*, under Captain W.J.S. Pullen, remained at Beechey Island to serve as a depot and retreat vessel, in the event that the other ships should meet with disaster.

In the fall of 1852, Belcher led a boat party from Northumberland Sound to the northern extremity of Grinnell Peninsula, from whence he turned north to discover the islands of Cornwall, Table, and Exmouth. The following spring, Belcher, travelling with man-hauled sledges, continued his explorations in northern Devon Island by tracing the coastline as far east as Cardigan Strait. Belcher also discovered Arthur Fiord, which he mistook for a strait separating Grinnell Peninsula and Devon Island.

Belcher's attempt to return to England in the summer of 1853 failed because of adverse ice conditions. The *Assistance* and *Pioneer* were forced to winter near Baring Bay on the west coast of Devon Island, while the *Resolute* and *Intrepid* were beset by ice in Barrow Strait near the southwestern extremity of Bathurst Island. In the spring of 1854, Belcher, dreading the prospect of spending a third winter in the Arctic, and fearing for the health of his men, ordered abandonment of the four advanced ships. The crews of the abandoned ships walked over the ice to Beechey Island and returned to England aboard the *North Star* and two other ships that had recently arrived from England.

Beechey Island was visited in the summer of 1858 by Captain F.L. M'Clintock (1860), who erected there a marble tablet that had been commissioned by Lady Franklin to commemorate her husband and his men, most of whom were known to have perished sometime around 1848 in the environs of King William Island.

Another Franklin search expedition, sent out by the British Admiralty in 1852, was led by Commander E.A. Inglefield (1853a, b) of the *Isabel*. The object of this expedition was to examine the northern reaches of Baffin Bay. Inglefield sailed up the west coast of Greenland and proceeded to latitude 78°21'N in Smith Sound, 140 miles (225 km) beyond any previous expedition in this sound. Returning south along the coast of Ellesmere Island (which he named), Inglefield passed through Glacier Strait and into Jones Sound. Skirting the south coast of Ellesmere near Harbour Fiord, he then crossed to the north coast of Devon Island, from whence he sailed eastward through Lady Ann Strait and on to Lancaster Sound. Proceeding along the south coast of Devon Island, Inglefield reached Beechey Island on September 7, where he located Pullen and the *North Star*. The next day he left for England. Inglefield is credited with charting the north coast of Devon Island as far west as Cape Hardy.

In 1875, Sir Allen Young was sent out by the British Admiralty in the *Pandora* with instructions to proceed from Lancaster Sound "towards the magnetic pole, and, if practicable to navigate through the North-West Passage to the Pacific Ocean in one season" (Young, 1876, p. 1). Young reached Beechey Island on August 26 where he examined the stores left in Northumberland House, which had been built by Pullen. The house had been broken into by bears, and after putting the stores in order and making the house secure, Young set off the same day for Peel Sound. He proceeded down Peel Sound and, by late September, had reached the latitude of Bellot Strait. There, a storm and fear of the possibility of having to spend a winter in the Arctic caused him to abandon the primary object of the expedition and return home to England.

The eminently successful Norwegian expedition in the *Fram*, under the command of Captain Otto Sverdrup (1904), was the last to figure in the coastal survey of Devon Island. The expedition left Norway in 1898 and returned in 1902. From 1900 to 1902, the *Fram* lay in Good Fiord on the south coast of Ellesmere Island, and it was during these years that the coastline was delimited from Cape Hardy to Sir Edward Belcher's easternmost camp in Cardigan Strait. Before dropping anchor in Goose Fiord in the fall of 1900, Sverdrup had sailed the *Fram* along the northwest coast of Colin Archer Peninsula on Devon Island, and had discovered the small island of St. Helena at the eastern extremity of the peninsula. He continued through Cardigan Strait into Belcher Channel, where the ship was stopped by ice. The expedition took refuge in Goose Fiord. The following summer, from Goose Fiord, a party led by Sverdrup himself and travelling by boat charted the coast of Devon Island from St. Helena Island to the head of Viks Fiord, from whence the party travelled east to Boat Point. From there, the party returned to Goose Fiord. The following spring (1902), G.I. Isachsen and E. Bay made a journey by dog sledge along the north coast of Devon Island from Cape Sparbo to Skruis Point. The same spring, another sledging party travelled by way of North Kent Island, Arthur Fiord, and Wellington Channel to Beechey Island, establishing that Arthur Fiord was not a strait.

Previous geological investigations

Charles Konig (1821) published the first account of the geology of the Canadian Arctic Archipelago on the basis of geological specimens and observations made by members of W.E. Parry's voyage of discovery through Lancaster Sound and on to Melville Island in 1819, and their return via the same route the following year. Konig's report is couched in Wernerian terms, and his opening remarks are, "We may conclude, from the nature of the rock specimens collected on the former voyage for discovering the North-West Passage, that both the east and west coast of Davis' Strait and Baffin's Bay are composed of primitive formations, in connexion with others of more recent date, which for the greatest part belong to several members of the Werner's trap formation". After elaborating further on these particular rocks, Konig goes on to say, "Compared with these rock specimens from the western coast of Baffin's Bay, those gathered on the coasts where Captain Parry's discoveries commenced seem to indicate a considerable difference in the respective geological features of those tracts. The north coast of Barrow's Strait[1], as far westward as the Polar Sea, and part of the eastern coast of Prince Regent's Inlet, appear to exhibit a character belonging to those more recent formations which are known to proceed from the primitive mountains of Scandinavia, and other explored tracts of high northern latitudes. Among them a variety of limestone seems to prevail, which is very like the Alpine or mountain limestone. It is compact, of yellowish and greyish colour, and contains, among other remains of zoophytes and shells, abundance of the same species of Terebratula, which are characteristic of that rock in various alpine tracts in Europe. A greyish-brown fetid variety of limestone, from the north side of Barrow's Strait, bears great resemblance to the mountain limestone as it occurs in Derbyshire; it contains parts of corallines, which are, however, too imperfect to be determined. The chert, or hornstone, of which likewise specimens were found in those parts, may, perhaps, occur as subordinate beds in this transition limestone. Among the specimens from the Cape Riley is a fragment of white granular marble passing into compact". Although Konig's account makes quaint reading today, it is fitting here to pay tribute to his perspicacity in recognizing that what are now referred to as Precambrian basement rocks are widely distributed on both the Greenland and Canadian sides of Davis Strait and Baffin Bay, and that these rocks are overlain, and give place westward, in the lands bordering Lancaster Sound, to mainly carbonate strata later referred to the Paleozoic.

Scattered geological, and, in some instances, physiographical observations have resulted from various expeditions that visited the report area during the 125 years that followed Konig's sojourn there (1821). Precambrian rocks were collected near Cape Warrender, in southeastern Devon Island, during W.E. Parry's third voyage to the archipelago, and were reported on by R. Jameson (1826), a leading exponent of the Wernerian school of geology. Collections of Silurian fossils made along the west coast of Devon Island and neighbouring parts of the archipelago by sledging parties from Captain William Penny's expedition, which wintered off the south coast of Cornwallis Island in 1850-1851, were described by J.W. Salter (1852) of the Geological Survey of Great Britain (see also Salter, 1853, 1855). During F.L. M'Clintock's voyage of 1857-1859 undertaken in the *Fox*, Precambrian crystalline rocks were collected in southeastern Devon Island and Silurian fossils were collected at Beechey Island. These materials are reported in Rev. Samuel Haughton's "Geological Account of the Arctic Archipelago" that is included as an appendix to M'Clintock's narrative account of the expedition (1860; see also M'Clintock, 1857). Haughton's account is of particular interest because it represents the first regional synthesis of the geology of the archipelago and is accompanied by the first geological map of the region. On this map, the location of the Precambrian-Paleozoic contact on the south coast of Devon Island is shown for the first time, and has been extrapolated to the north coast. A somewhat more precise location of this contact on the north coast was given later by Per Schei (1904), geologist on the Second Norwegian Polar Expedition undertaken in the *Fram*. In 1878, Henry Woodward, of the British Museum, figured and described a small collection of fossils, mainly corals, collected at Beechey Island by members of Sir Allen Young's expedition of 1875. All but one of Woodward's species, *Alveolites? arctic* Woodward, had been described by Salter in 1852. In 1904, A.P. Low of the Geological Survey of Canada cruised the *Neptune* along the south coast of Devon Island, making landings at Beechey Island and Cuming Inlet. Low's (1906) report contains brief geological observations made along this stretch of coast and a list of Silurian fossils

[1]Barrow's Strait as used here by Konig is more or less synonymous with Lancaster Sound of modern usage. The definition of Lancaster Sound and Barrow Strait as hydrographic features has had a rather complex history, which has been described by Taylor (1955, p. 26).

collected at Beechey Island and identified by H.M. Ami. In 1927, L.J. Weeks of the Geological Survey of Canada who, in 1925 had accompanied the *Arctic* on her annual cruise of the Arctic, published a brief account of the geology and physiography of the environs of Dundas Harbour. D.A. Nichols (1936), in a paper dealing with raised beaches in Arctic Canada, recorded the gastropod *Littolina* sp. from an elevation of 145 feet (44.2 m) above sea level at Dundas Harbour.

D.B. Wales (1949), on the basis of field investigations carried out in 1948 at Dundas Harbour, was the first to demonstrate the presence of Cambrian strata on Devon Island. The first detailed study of rocks on Devon Island may be regarded as having commenced in 1949 when V.E. Kurtz and D.B. Wales of Dartmouth college measured and described 1200 m of Paleozoic strata overlying the Precambrian crystalline rocks at Dundas Harbour (Kurtz, McNair and Wales, 1952). The strata, which ranged in age from Early Cambrian to Middle Ordovician, were distributed in six new formations. V.K. Prest (1952) visited Dundas Harbour in 1950 and made observations on the bedrock formations and raised beaches. The geology of several, widely separated localities within Devon Island was investigated during Operation Franklin, an airborne Geological Survey field program directed by Y.O. Fortier in 1955. The titles and authors of the publications resulting from this work are as follows: Burnett Inlet, Glenister (1963a); Sverdrup Inlet to Cape Sparbo, Glenister (1963b); Cape Sparbo area, Roots (1963a); Herschel Bay and Rigby Bay, Glenister and Thorsteinsson (1963); Vicinity of Beechey Island to Radstock Bay, Greiner (1963a); Haughton Dome and area southwest of Thomas Lee Inlet, Greiner (1963b); Boat Point, Greiner (1963c); South Arm of Viks Fiord, Fortier (1963b). The foregoing papers are included in a single publication by Y.O. Fortier et al. (1963). In this same work are found a physiographical account by Roots (1963b), and a geological reconnaissance map of Devon Island.

An important contribution to knowledge of Cambrian to Lower Ordovician rocks in eastern Devon Island has been given by Cowie (1971). Cowie's study is based on his own field investigations on Devon Island and those of others, particularly Kurtz et al. (1952), and it deals at length with the problems attending the correlation of these rocks on Devon Island with those in other parts of the North American Arctic.

In 1968 and 1969, Christie (1977) carried out a stratigraphic reconnaissance study of Cambrian and Ordovician rocks at Sverdrup Inlet on the north coast of Devon Island, and Cuming Inlet and Croker Bay on the south coast.

The impact origin of the Haughton crater, previously considered a gypsum diapir and named the Haughton Dome, was established by Robertson and Mason (1975), on the basis of shatter cones obtained from the crater. The structure and stratigraphy of the crater were described later by Frisch and Thorsteinsson (1978).

Fieldwork and responsibilities of the authors

This report presents the results of stratigraphic and mapping studies carried out between 1973 and 1980. With the exception of 1978, Thorsteinsson spent an average of about two weeks working on Devon Island during each of these field seasons. Most of the field data on which the report is based, however, were acquired during the field season of 1978, by a field party directed by Thorsteinsson and Mayr from two main base camps, established in tent quarters on Devon Island. The first camp, which was occupied during July, was on the west side of Croker Bay (UTM Zone 17x, 421200E, 8292900N; *Dundas Harbour*), the other was in Haughton Astrobleme (UTM Zone 16x, 428500E, 8366300N; *Bear Bay West*), and was occupied during the month of August.

Fieldwork in 1978 was supported by both fixed-wing and helicopter aircraft. A DHC-3 Otter with large, low-pressure tires was supplied by Bradley Air Services Ltd. of Carp, Ontario, and piloted by M. Veales. A Hughes 500C helicopter, under contract from Liftair International Ltd., was piloted by J. Sutherland, with E. Godletsky serving as engineer. The Otter, able to land on unprepared terrain at many localities, was used as support both for the base camp and helicopter, and for geological work.

Other members of the 1978 field party included: senior geological assistant G.M. Narbonne; geological student assistants T.A. Garagan and R.O. Nodwell; W.S. Harvey, who served as camp manager and radio operator; Janet P. Aikenhead, cook; and D. Letts, the expediter at Resolute.

The text of the present report was written by the authors as follows: chapters I, II and V by Thorsteinsson; chapters III and VI jointly by Mayr and Thorsteinsson; chapter IV and appendices by Mayr.

Acknowledgments

Thanks are expressed to G. Hobson, Director of the Polar Continental Shelf Project, for logistical support provided on numerous occasions, and to other members of that organization – particularly F. Alt, F. Hunt and W. Prestly – for many courtesies extended to members of the Geological Survey during the course of the field studies. Acknowledgment is made also to the following persons who assisted in fossil identifications and supplied information on ages and correlations: Drs. C.R. Barnes, M.R. Dawson, W.H. Fritz, W.S. Hopkins, Jr., N.S. Ioannides, B. Jones, B.S. Norford, G.S. Nowlan, T.T. Uyeno, J.H. Wall and R.M. West. Special thanks are extended to G.M. Narbonne, senior geological assistant in 1978, whose measured and described sections have contributed substantially to the stratigraphic framework presented herein.

Semiquantitative X-ray diffraction analysis was carried out by G.P. Michael in the geochemistry laboratories of the ISPG; X-ray fluorescence analysis was undertaken in the analytical chemistry laboratory of the GSC in Ottawa, under the supervision of J.L. Bouvier. The classification program for volcanic rocks used for the dyke material was set up by E. Irvine and W.R.A. Baragar in Ottawa.

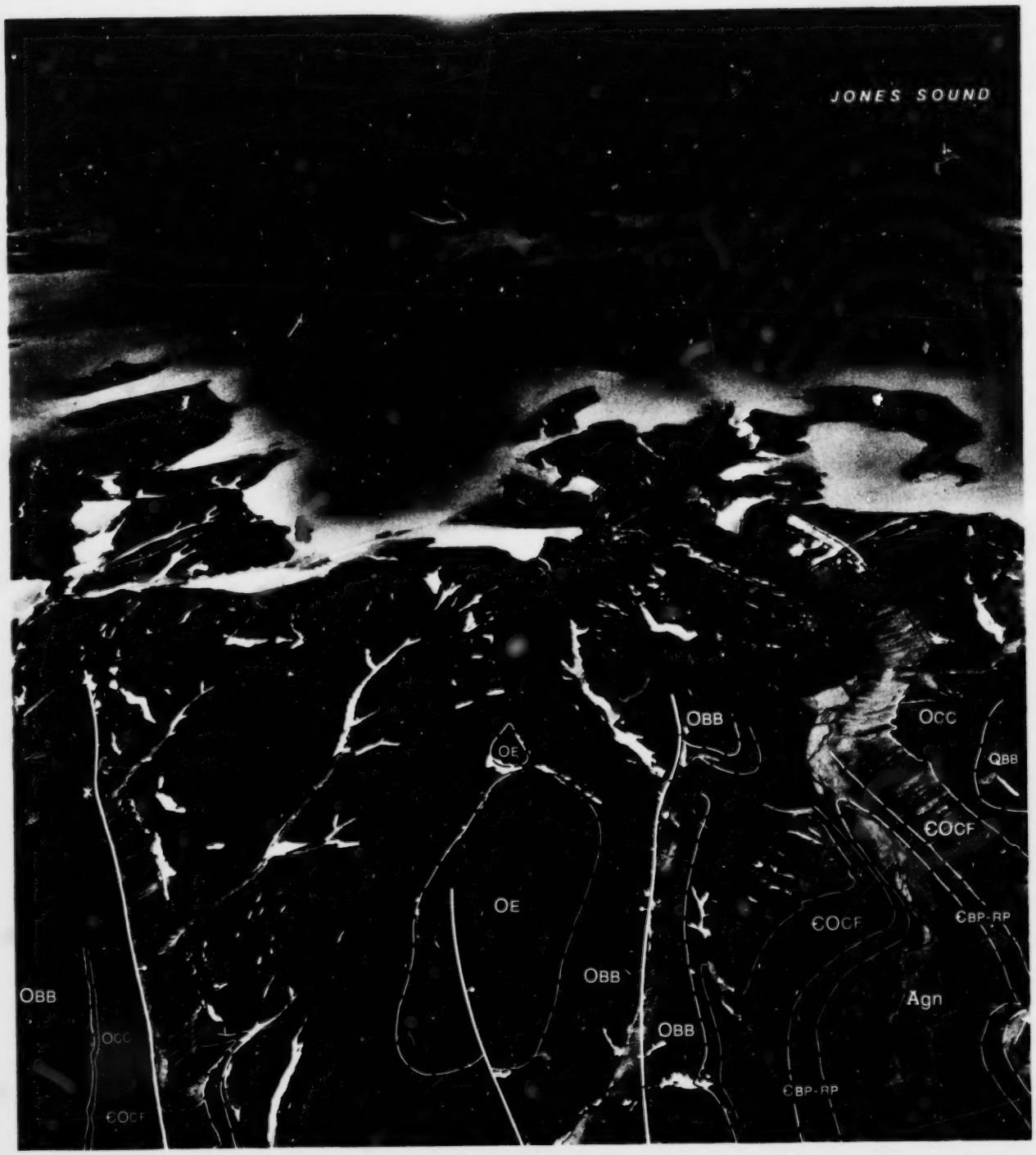

Figure 3. *Oblique aerial photograph (T439R-32) of the interior of Devon Island looking west from a position approximately above the head of Croker Bay on the south coast of Devon Island and across* **Powell Inlet.** *In the background is the thin, irregularly shaped arm of the main ice cap (which is situated to the north and out of the field of view) that extends some 80 km to the west. The photograph illustrates: the fact that the glaciers appear to have formed after the development of the drainage lines; the relatively more deeply dissected nature of the plateau in coastal areas; and fault-controlled streams. The photograph also illustrates the characteristic topographic expression of several bedrock formations in nearly flat-lying situations. Flat-topped mesas, formed by the lower resistant member of the Eleanor River Formation* (OE), *occupy the interstream areas and form the highest parts of the uplands. Underlying the Eleanor River is the recessive, slope-forming Blanley Bay Formation* (OBB). *Underlying the latter is the thin, but markedly resistant Cape Clay Formation* (OCC) *that forms a nearly continuous rimrock along the two principal streams. The Cape Clay is underlain by much thicker and relatively softer weathering Cass Fjord Formation* (ЄOCF). *The arrow points to excellent exposures of the Rabbit Point and Bear Point formations* (ЄBP-RP), *hidden from view because of the oblique field of view, where section 12 (Fig. 7) was studied. X marks the location from which the Figure 81 photograph was taken.* Agn = *Precambrian gneiss.*

CHAPTER II

PHYSIOGRAPHY AND GLACIATION

Devon Island is a region of relatively uniform physiography. It consists mainly of a high plateau that is bordered, in most places, by spectacular sea cliffs, and is indented by deep fiords. It also includes ice caps and limited tracts of coastal lowlands. Ice caps are particularly prominent features in the eastern part of Devon Island, and the large, easternmost ice cap is of sufficient size to constitute, in itself, a distinctive physiographic region.

The plateau

The surface of the plateau truncates a gently dipping succession of lower Paleozoic rocks, in the western three quarters or more of Devon Island, and Precambrian crystalline rocks in the remaining, eastern part of the island. The plateau clearly represents an ancient peneplain that is regionally tilted to the west. The plateau is highest in the east, where it attains an elevation of about 1500 m[1] above sea level, and it slopes gradually westward to an elevation of about 300 m near Wellington Channel. Correlated with this slope is the height of the sea cliffs, which are as much as 600 m in height in the east and average about 150 m in height in the environs of Wellington Channel. The plateau is in a youthful stage of a new erosion cycle. It is much dissected, in coastal areas, by fiords, and by steep-walled streams that are actively downcutting and extending headward (figs. 1, 82). Inland, the character of the plateau is dominated by: broad expanses of flat-topped uplands forming interstream areas (figs. 1, 82); less expansive areas of gently rolling hills that occur mainly in western parts of the island (Fig. 62); occasional mesas or buttes, found mainly in coastal areas where dissection of the plateau is greatest; and rare, craggy pinnacles resulting from some particularly resistant rock units (Fig. 56). Inland the density of streams is low, and large areas of the plateau are devoid of drainage lines. All of these characteristics of the plateau, together with the prevailing drab grey, yellow and brown weathering colours of soil and bedrock alike, including the virtual absence of plant and animal life, have combined to form a landscape of almost unrelieved desolation.

The plateau is drained mainly by short streams that flow north, south, east and west, and which rise from an irregular, east-west divide along the main axis of this region. The stream pattern is largely dendritic. Most of the trunk streams and their tributaries are clearly consequent, but many tributary streams are adjusted to joints and faults. A few trunk streams are clearly fault-controlled, but even these appear to be essentially consequent in that the controlling faults strike into one or other of the bordering seaways (see, for example, Sverdrup Inlet in *Bear Bay East*, Powell Inlet in *Powell Inlet*, and Dundas Harbour in *Dundas Harbour*). The overall character of the drainage pattern seems to indicate that the principal streams did not develop until Devon Island had attained its approximate present outline; and, furthermore, that the incision of the streams was well underway before westerly tilt of this region was effected, or at least before the tilt was sufficiently advanced to cause any significant shift in the headward erosion of streams toward the east.

Prominent valley glaciers from the main ice cap occupy the heads of Croker Bay and Dundas Harbour (*Dundas Harbour*). Elsewhere, broad, U-shaped valleys devoid of glaciers characterize the heads of most of the fiords, and it is in these fiords that most of the trunk streams reach tidewater. A few trunk streams still are actively downcutting in bedrock up to their confluence with the sea, but most have attained grade for varying distances along their lower reaches. Traced inland, the U-profiles of the valleys give place gradually to steep-walled, V-shaped valleys which, in turn, give place abruptly to waterwalls or cascades at the edge of the plateau.

Glaciation

The most convincing evidence that Devon Island was at one time covered by ice is the presence of numerous fiords outside those parts of the island now occupied by active outlet glaciers. Further evidence of a more extensive ice cover is provided by the rock-basin lakes that occur sparsely throughout the plateau, and which are especially common in two general areas: north and east of the head of Maxwell Bay (*Maxwell Bay*); and south and east of Dragleybeck Inlet on the west coast of the island (*Bear Bay West*).

There is another line of evidence that attests to a time of more extensive ice cover. Sparsely distributed metamorphic and igneous rocks of pebble to boulder size occur at all elevations in those parts of Devon Island that are underlain by Phanerozoic rocks. Some of these rocks occur at elevations within the range of postglacial marine emergence, for example on the raised beach deposits, and may have been rafted by sea ice to their present positions, and would, therefore, not be true glacial erratics. But the origin of the rocks that occur above the highest marine limit, particularly those on the high plateau surface, must be attributed to some other process, and it seems reasonable to interpret them as erratics derived from glacial ice that moved from east to west across the island. The problem of the origin of these rocks goes beyond Devon Island, and is one of long standing (Thorsteinsson, 1958; Craig and Fyles, 1960; Tozer and Thorsteinsson, 1964; Pelletier, 1966). Erratic-like metamorphic and igneous rocks occur in situations similar to those described above on Devon Island on all of the Queen Elizabeth Islands, and appear to be derived from Precambrian terranes far to the south, southeast, or east. Probably most, or all of these rocks are true glacial erratics that were derived from a lobe of the Laurentide Ice Sheet that moved across these islands, but for which there is as yet no other

[1] The highest point of land on Devon Island, given here as 1500 m, occurs beneath the main ice cap at latitude 75°21'N and longitude 82°25'W, and was determined by means of radio echo sounding (Paterson and Koerner, 1974).

supporting evidence. There are alternative explanations for these rocks, particularly the smaller ones, that cannot be discounted entirely; namely that they were emplaced by streams that relate to the time of peneplanation represented by the plateau remnants that dominate the physiography of the archipelago (Craig and Fyles, 1960); or that they are remnants of the Miocene Beaufort Formation that appears to have once covered much of the archipelago. It is difficult to believe that anything other than glacial ice could have transported the larger boulders, some of which attain diameters of about three metres.

It is appropriate at this juncture to review briefly the salient features of the glacial history of the Queen Elizabeth Islands as presented by Blake (1975; and references contained therein). During the glacial maximum, these islands, including the channels between islands, are believed to have been covered by a single, multi-domed mass of ice to which Blake (1970) has given the name Innuitian Ice Sheet. The ice sheet was connected with the Greenland Ice Sheet by way of Ellesmere Island, and with the Laurentide Ice Sheet south of Parry Channel[1], although a lobe of the latter ice sheet is known to have crossed Parry Channel and to have reached southern Melville Island. The major inter-island channels are U-shaped, and they mark the sites of outlet glaciers that followed preglacial river systems established in the Tertiary, when the land now included in the archipelago stood higher relative to sea level than at present (Fortier and Morley, 1956). Some of the glaciers flowed northwesterly into the Arctic Ocean from a divide trending roughly northeast from Bathurst Island to central Ellesmere Island, while others flowed easterly into Baffin Bay. The main east-flowing glaciers reached Baffin Bay via Lancaster and Jones sounds, both of which derived ice from source areas to the west, north and south. Pelletier (1966) has pointed out that these sounds are U-shaped in transverse section, and that their submerged parts exhibit several other features characteristic of glaciated valleys; for example, U-shaped hanging tributaries heading shoreward into fiords, and faceted spurs between the mouths of the tributaries. Pelletier (*op. cit.*) has also described Lady Ann Strait, between Coburg Island and Devon Island, as comprising a continuation of the axial trough in Jones Sound, and his Figure 9 (p. 92) shows the presence of a glacial valley in Baffin Bay, close to the east coast of Devon Island, in which ice is presumed to have flowed southward. The submarine topography of Wellington Channel has not been described in the same detail as that of the other major waterways bordering Devon Island, but from what is known of the bathymetry of this channel, and considering the glacial history of the surrounding area, it seems safe to conclude that it, too, is a drowned glacial valley through which ice entered the western extremity of Barrow Strait before turning eastward into Lancaster Sound.

According to Prest (1970), recession and wastage of the once continuous ice sheet in the Queen Elizabeth Islands took place on individual islands, a process that is not yet completed for some of the easternmost islands, of which Devon Island is one example.

The origin of the prominent sea cliffs along much of the perimeter of Devon Island is a matter of considerable importance to an understanding of the physiography of this region. The sea cliffs are, for the most part, protected from the erosive action of waves and floating ice by narrow beaches or aprons of talus (figs. 45, 50), and places where cliffs rise sheer from the water are confined to small lengths of coastline, mainly along headlands (Fig. 58). Inasmuch as marine erosion is at present clearly a negligible factor in shaping, or even maintaining the cliffs, it seems reasonable to assume that they have been formed mainly by some other process, of which glacial erosion seems the most obvious, particularly in view of the evidence that the sea cliffs within the confines of the fiords in this region owe their origin clearly to sculpturing by outlet glaciers[2], and the evidence that all of the bordering waterways were themselves occupied by major outlet glaciers during the glacial maximum.

The main ice cap is roughly circular in outline and dome-shaped, and covers about the eastern quarter of Devon Island. The ice cap has a summit level of 1885 m above sea level that occurs near its geographic centre (Koerner, 1970). To the north, east and south, numerous outlet glaciers discharge into the sea. Many of these flow through steep-walled gorges, but others, along the coast of Baffin Bay, appear as broad, apron-like extensions of the ice cap itself. To the west, the main ice cap gives place to a relatively thin, irregularly-shaped arm that extends westward for a distance of some 80 km. Between this tongue and the south coast, and extending as far west as the west side of Maxwell Bay, are a series of mostly small ice caps and ice fields occupying interstream areas (Fig. 3).

In spite of the fact that the plateau surface is well developed up to the western margin of the main ice cap, radio echo sounding traverses on the ice cap have indicated that the underlying terrane is mostly very irregular (Paterson and Koerner, 1974; Koerner, 1977). This conclusion finds further support in the rugged aspect of the few, small, ice-free areas within the limits of the ice cap (for example, the Cunningham Mountains). The highly dissected character of the terrane beneath the ice cap is probably due to to the higher elevation of this part of the island, which permitted more rapid headward erosion by streams in preglacial times, and to the longer duration of glacial erosion in this region.

The dearth of constructional landforms and other typical effects of glaciation on the plateau surface of Devon Island is noteworthy. This matter has been dealt with at length by Roots (1963b), who noted that the present-day ice caps have little erosive effect on the underlying land surface, and he concluded that the former ice cover was also largely protective rather than an agent of erosion. According to Roots (*op. cit.*), this condition results from the fact that ice caps in these northern latitudes are largely "cold-based" (i.e., frozen to bedrock), and it is only the valley glaciers, with their steeper gradients, that are able to act as scouring agents.

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[1]The Parry Channel is a name applied to the series of westerly trending waterways that includes Lancaster Sound, Barrow Strait, Viscount Melville Sound and M'Clure Strait, and which separates the Queen Elizabeth Islands from other islands of the archipelago to the south of the channel.

[2]Lewis et al. (1977, p. 499) have stated that "The bays and inlets of southern Devon Island are dominated by north-south trending ridges and depressions, presumably horsts and grabens". However, a careful inspection of the maps of *Dundas Harbour*, *Powell Inlet* and *Maxwell Bay* can leave little doubt that this is probably not the case. None of the bays and inlets on the south coast exhibit faults that might conceivably extend seaward to form horsts or grabens. This is true, moreover, for all the bays and fiords on Devon Island with one notable exception, namely Viks Fiord in *Bear Bay West*, which is clearly a partially drowned graben.

The lowlands

Tracts of lowlands occur at various places along the coast of Devon Island. The most notable of these are described below.

A lowland, as much as 10 km wide, extends from Dragleybeck Inlet on Wellington Channel up to, and beyond, the northwestern extremity of the *Bear Bay West* map area. The lowland coincides, for the most part, with the distribution of the graptolitic carbonate and clastic rocks of the Devon Island Formation, and reflects the softness of these rocks. The lowland is dominated by marine strand lines, and by ponds, lakes and tundra. It rises gradually eastward to elevations of about 100 m, where it merges with rolling uplands developed on the more resistant Douro Formation that underlies the Devon Island Formation. The lowland appears to have originated mainly from subaerial erosion in preglacial time.

A lowland, lying at elevations of 30 m or less, extends eastward from the environs of Erebus Bay, at the southwestern extremity of Devon Island (*Maxwell Bay*). To the south of this lowland and facing Lancaster Sound are three prominent mesas, one of which comprises Beechey Island. The mesas clearly represent remnants of the main body of the Devon Island plateau that lies to the north of the lowland. The eastern extremity of the lowland is marked by a butte, named Caswall Tower, on the shore of Radstock Bay. The origin of the lowland is not clear. Possibly it is primarily a wave-cut bench, in which case Caswall Tower is probably a sea stack. However, because of the proximity of the lowland to fiord-like Radstock Bay, it seems more likely that the lowland is mainly the result of glaciation.

A prominent lowland with elevations up to about 60 m characterizes both sides of Croker Bay at the confluence of that bay and Lancaster Sound (*Dundas Harbour*). The lowland is cut in bedrock that is thinly veneered with raised beaches, and contains numerous lakes and ponds. This lowland appears to have been formed by a combination of fluvial and glacial processes.

An area of lowland that includes Cape Sherard marks the southeastern extremity of Devon Island (*Dundas Harbour*). Well developed, raised strand lines are evident on aerial photographs of this lowland, which, however, was not visited during the present field studies.

Philpots Island forms the easternmost extremity of Devon Island, to which it is joined by a narrow isthmus (*Dundas Harbour*). Philpots Island was not visited by the authors, and the following notes are based on a study of aerial photographs. The island is about 430 km^2 in area, and represents the largest lowland area of Devon Island. Most of Philpots Island lies within about 60 m of sea level, but a few isolated hills of bedrock, the highest of which is about 240 m above sea level, rise abruptly from the lowland in the northeast. There are numerous bedrock exposures, but the island appears to be largely covered by a thin veneer of unconsolidated material. Lakes and ponds are numerous, but raised beaches are rare. Bedrock exposures are largely Precambrian basement rocks. However, a thin cover of presumed Paleozoic strata overlies basement rocks in a limited area of the island opposite Bethune Inlet (Frisch, 1981).

A series of six lowland areas, none of which is more than about 5 km wide, extends for a distance of some 65 km from Cape Sparbo to, and beyond, Cape Newman Smith (*Bear Bay East*). The continuity of these lowlands is broken variously by headlands and bays. The lowlands are developed on Precambrian crystalline rocks and are characterized by hummocky hills of bedrock, emerged strand lines, patches of tundra, and numerous lakes and ponds, some of which lie in rock basins. In places, numerous offshore islets indicate that the planation surface represented by these lowlands extends out to sea. The origin of these lowlands is uncertain.

CHAPTER III

STRATIGRAPHY

The sedimentary rocks of Devon Island are situated within the Arctic Platform (Fig. 4). Although Proterozoic, Paleozoic, Mesozoic and Cenozoic times are represented by these rocks, the sedimentary record is notably incomplete, with long intervals of geological time unrepresented. By far the greater part of the sedimentary column in this region, in terms of age span and thickness, is made up of lower Paleozoic strata; and rocks of Proterozoic, Mesozoic and Cenozoic ages comprise only an incidental part.

The nomenclature, thicknesses and lithologies of the sedimentary rocks of this region are summarized in Table 1.

The sedimentary rocks may be divided into three structurally concordant successions that are separated from one another by major regional unconformities, and a fourth succession that includes two unnamed formations in the Haughton crater. The successions are summarized below:

1. Proterozoic rocks, represented by a unit of mainly siltstone and sandstone, that are referred provisionally to the Strathcona Sound Formation, as defined on Baffin Island. Outcrops of this formation are limited to the entrances of Powell Inlet and Cuming Inlet (*Powell Inlet*) on the south coast of the island. The formation, which ranges from a feather edge to 180 m thick, lies unconformably on Precambrian basement, and is overlain unconformably by Cambrian rocks.

2. Paleozoic rocks form a homoclinal succession that strikes northerly, and dips westerly away from exposed Precambrian crystalline rocks that constitute the structurally highest, eastern part of the island. The oldest formation, which is Cambrian in age, outcrops in extreme eastern parts of the report area, and progressively younger formations appear as the succession is followed westward. The youngest Paleozoic rocks are Early Devonian in age. Unconformities within the Paleozoic succession occur between Lower and Middle Cambrian rocks, within Middle Cambrian rocks, and probably between rocks of latest Ordovician and Early Silurian ages. The Paleozoic rocks consist mainly of limestone and dolomite with lesser amounts of sandstone, shale and evaporites. They are divisible into fifteen formations of which one (Blanley Bay Formation) is defined herein. The aggregate thickness of these formations is about 3700 m.

3. Soft, easily weathered sediments, ranging from Early Cretaceous to early Cenozoic in age, are preserved in a series of grabens in northwestern Devon Island (*Bear Bay West*), where they lie unconformably on various older Paleozoic formations. The sedimentary succession includes in ascending order, the Hassel (nonmarine sandstone), Kanguk (marine shale) and Eureka Sound (nonmarine sandstone) formations. These formations are poorly exposed, and their stratigraphy therefore is inadequately understood. The cumulative thickness of these formations is about 700 m. All three formations are best developed in the Sverdrup Basin in northwestern parts of the archipelago, and their occurrence on Devon Island is of particular interest in providing further documentation of a paleogeographical connection between the Sverdrup Basin and Baffin Bay from Early Cretaceous to Middle Eocene times.

4. Two unnamed formations occur within the crater of Haughton Astrobleme, and are of local significance only. The older formation consists of polymict impact breccia. It lies unconformably on various older, intensely deformed Paleozoic formations within the crater. The maximum thickness of beds preserved is about 90 m. Lying partly on the impact breccia and partly on Paleozoic rocks is a sequence of lake sediments consisting of dolomite silt and sand. These sediments are about 28 m thick. They are dated as Miocene, and the impact breccia is assumed to be of about the same age.

Archean and/or Proterozoic

Precambrian crystalline rocks

Precambrian crystalline rocks outcrop extensively in coastal regions of eastern Devon Island, and much of the main Devon Island ice cap appears to overlie these rocks (see *Dundas Harbour*, *Powell Inlet* and *Bear Bay East*). Preliminary studies by Frisch (1979, 1981) have indicated that these rocks consist mainly of intensely deformed granulite-facies granitic and metasedimentary rocks traversed by diabase dykes. These rocks belong to the Churchill Province of the Canadian Shield and are considered to be of Archean and/or Proterozoic age (T. Frisch, pers. comm.).

Proterozoic

Strathcona Sound Formation

Definition

The Strathcona Sound Formation is part of a succession of Proterozoic strata that ranges from 4600 to 6100 m in thickness and lies nonconformably on a crystalline complex of Archean and Proterozoic age in northern Baffin Island and Bylot Island. The succession is divisible into three groups, named in ascending order, Eqalulik, Uluksan and Nunatsiaq (see Jackson and Iannelli, 1981, and references contained therein). The Nunatsiaq Group includes, in order upward, the Athole Formation (limestone, sandstone, shale), Strathcona Sound Formation, and Elwin Formation (sandstone, siltstone, dolostone). The Strathcona Sound, as described by Jackson and Iannelli (*op. cit.*, p. 287), comprises "a wide variety of complexly interfingering lithologies. These are mainly laminated to thin-bedded shales and siltstones, thin- to very

TABLE I. Formations of Devon Island

ERA OR EON	PERIOD OR EPOCH	FORMATION AND RANGE THICKNESS IN METRES	LITHOLOGY
CENOZOIC	PLEISTOCENE AND RECENT	*QUATERNARY*	Stream, deltaic, marine beach sediments
		Unconformity	
	MIOCENE	*Unnamed lake sediments*	Dolomite, silt; lesser amounts of dolomitic sand
		Unconformity	
		Unnamed breccia	Polymict impact-breccia
		Unconformity	
	EOCENE PALEOCENE	*EUREKA SOUND FORMATION* 200	Sandstone, siltstone, shale
MESOZOIC	CRETACEOUS	*KANGUK FORMATION* 500	Shale
		HASSEL FORMATION 100	Sandstone; minor amounts of siltstone and conglomerate
		Unconformity	
PALEOZOIC	DEVONIAN	*READ BAY GROUP*: *SOPHIA LAKE FM* 250+ (North of latitude 75°30'); *BARLOW INLET FM* 750 / *DEVON ISLAND FM* 600+ (North of latitude 75°30')	Dolomite; minor amounts of limestone, siltstone and gypsum; Limestone; minor amounts of dolomite and shale — North of latitude 75°30': Argillaceous limestone, shale
	SILURIAN	*DOURO FORMATION* 138-238	Limestone; minor amounts of shale and dolomite
		CAPE STORM FORMATION 430	Dolomite, limestone
		ALLEN BAY FORMATION 660	Dolomite, limestone
	ORDOVICIAN	*CORNWALLIS GROUP*: *IRENE BAY FORMATION* 6-16.5	Limestone, shale
		THUMB MOUNTAIN FM 55.5-140	Limestone, dolomite
		BAY FIORD FORMATION 128-290	Dolomite, gypsum; minor amounts of limestone, shale and siltstone
		ELEANOR RIVER FORMATION 150-260	Limestone, dolomite; minor amounts of gypsum
		BLANLEY BAY FORMATION 98-175	Dolomite, sandstone; minor amounts of limestone and gypsum
		CAPE CLAY FORMATION 65	Dolomite, limestone in environs of Dundas Harbour
	CAMBRIAN	*CASS FJORD FORMATION* 270-335	Dolomite, shale, sandstone, flat-pebble conglomerate; minor amounts of gypsum
		Unconformity	
		BEAR POINT FORMATION 25-86	Dolomite: minor amounts of limestone, shale, sandstone
		Unconformity	
		RABBIT POINT FORMATION 0-20	Sandstone
		Unconformity	
PROTEROZOIC		*STRATHCONA SOUND FM* 0-177	Siltstone, sandstone; minor amounts of dolomite
		Nonconformity	
ARCHEAN OR PROTEROZOIC		*Undifferentiated*	Intensely deformed granulite-facies granitic and metamorphic rocks

GSC

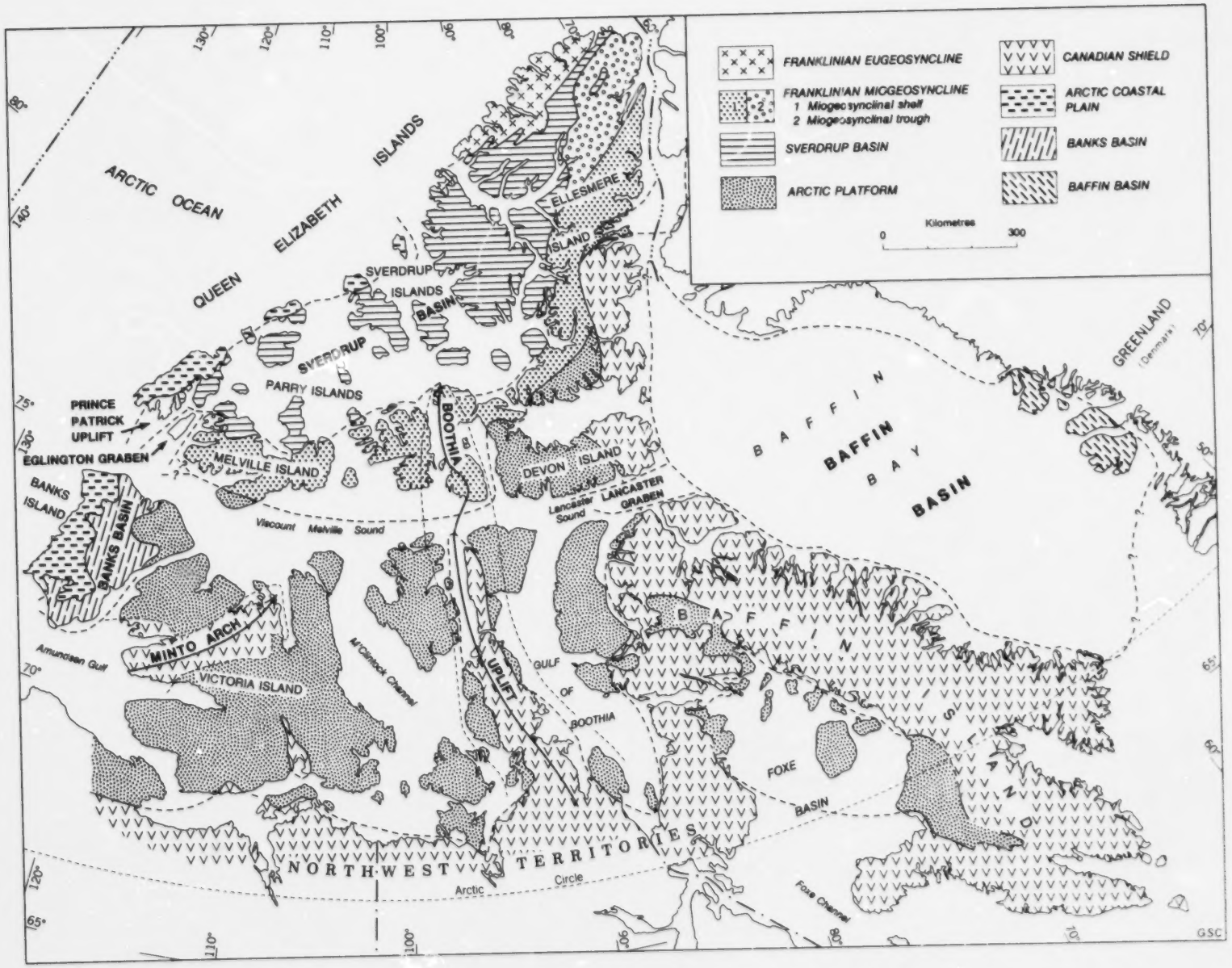

Figure 4. Major geological provinces of the Canadian Arctic Archipelago.

*Figure 5. Sea cliffs, about 2 km east of the east entrance to Powell Inlet on the south coast of Devon Island (**Powell Inlet**). View is to the northwest. The greatest thickness of the Proterozoic Strathcona Sound Formation, on Devon Island, occurs here, and the crossed hammers mark the approximate centre of the traverse along which section 16 of this formation (shown on Fig. 7) was studied. Agn = Precambrian gneiss; PSS = Strathcona Sound Formation; €BP-RP = Bear Point and Rabbit Point formations; €OCF-A, €OCF-B = members A and B, respectively, of the Cass Fjord Formation.**

thick bedded sandstones, stromatolitic dolostones, dolostone conglomerates, and polymictic conglomerates . . . These various lithologies occur singly, or interbedded with others in units up to 30 m, and rarely 110 m thick".

The Athole Formation is a facies equivalent of the lower, and possibly also the middle part of the Strathcona Sound Formation. Thus, in some places rocks referred to the Strathcona Sound overlie Athole rocks, whereas in other places they overlie the Victor Bay Formation, which represents the youngest formation in the underlying Uluksan Group. The basal contact of the Strathcona Sound with Victor Bay rocks is variously gradational or unconformable, and the contact with overlying Elwin rocks is gradational. In some places, however, where the Elwin appears to have been removed by erosion, sandstone of the Gallery Formation, which is possibly Early Cambrian in age, lies unconformably on the Strathcona Sound Formation. Where fully developed, the Strathcona Sound is more than 910 m thick. Prior to the present account, no formation belonging to the Eqalulik, Uluksan or Nunatsiaq groups had been reported outside of Baffin and Bylot islands.

Distribution and thickness

A relatively thin selvage of rocks, consisting mainly of redbeds that lie nonconformably on Precambrian gneissic rocks in the environs of the entrances to Cuming and Powell inlets (*Powell Inlet*; figs. 5, 6) is here referred tentatively to the Strathcona Sound Formation, on the basis of lithological similarities. The formation has a maximum thickness of 177 m along the coast of Lancaster Sound and thins to zero in both northerly and easterly directions, as a result of the sub-Cambrian unconformity.

Lithology

The Strathcona Sound Formation in Devon Island consists principally of very thin bedded, dusky-red weathering siltstone and sandstone. The thickest and most completely exposed outcrops of the formation occur about 3.5 km west of the entrance to Powell Inlet where section 16, shown graphically on Figure 7, was measured (see also Figure 5).

*See inside back cover for ISPG photo numbers.

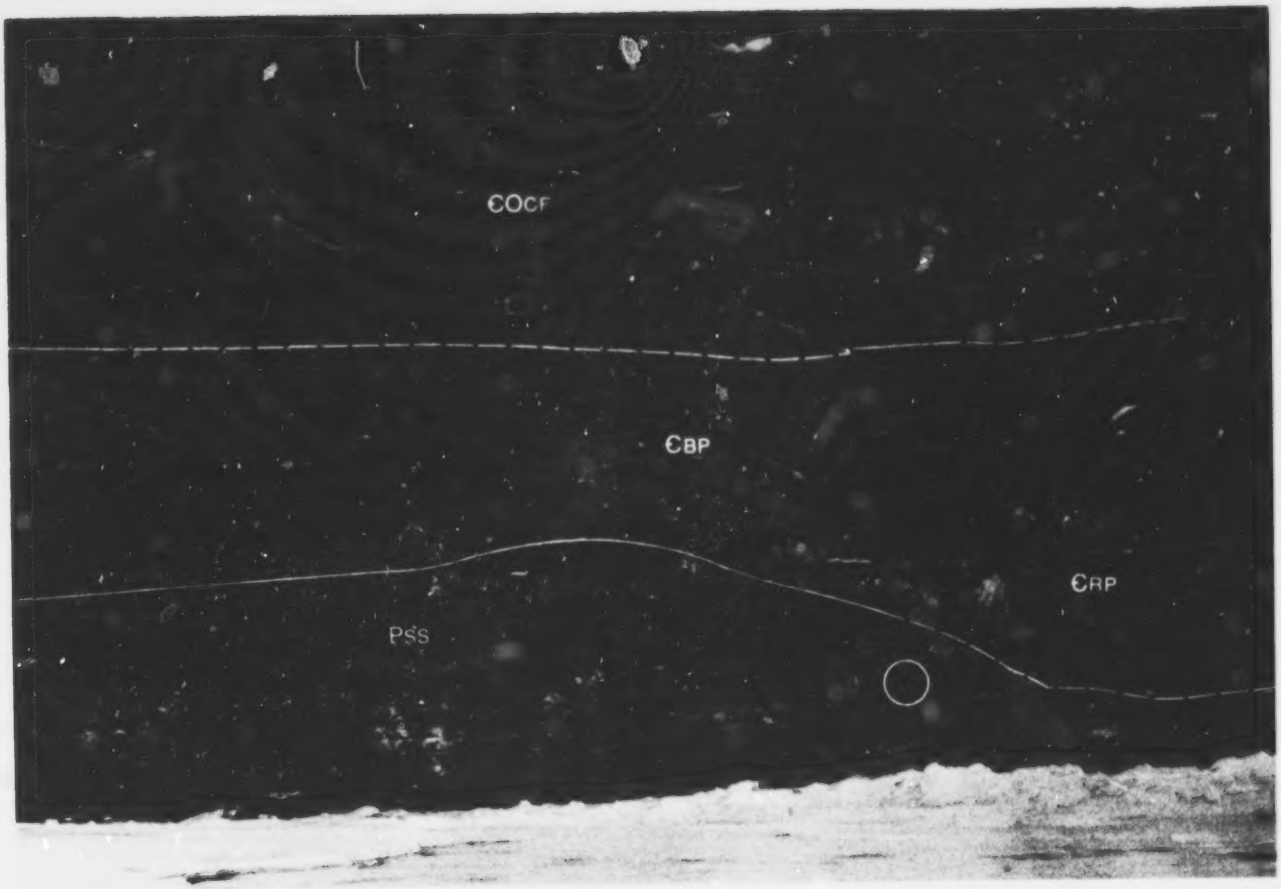

Figure 6. *Precambrian-Phanerozoic contact, east of the entrance of Cuming Inlet on the south coast of Devon Island, where section 3 (Fig. 7) was studied. Note the discontinuous, thick bedded, light coloured sandstone of the Lower Cambrian Rabbit Point Formation (CRP), infilling a depression in the Proterozoic Strathcona Sound Formation (PSS). At this locality, rocks of the Middle Cambrian Bear Point Formation (CBP) are nearly completely covered by talus. COCF = Cass Fjord Formation. Note man in circle for scale.*

Jackson and Iannelli (1981) subdivided the Strathcona Sound Formation on Baffin and Bylot Islands into six intergradational members of which only two are typically present in any given section: a lower shale-siltstone member and an upper arkose-greywacke member. The lower shale-siltstone member appears to be represented in the section studied east of Powell Inlet. It is divisible into three units, described in ascending stratigraphic order as follows:

1. A carbonate unit, 9.1 m thick, that forms a conspicuous ledge on the Precambrian crystalline rocks (Fig. 5). It consists of interlaminated dolomite and sandstone overlain by a thin conglomerate. The laminated rock is arranged in distinctive cycles 13 to 16 cm thick (Fig. 12). The cycles commence at the base with coarse grained dolomitic sandstone. This is overlain by dolomitic sandstone that is laminated and medium to fine grained. The top of the cycle consists of dolomite that is wavy laminated and very finely crystalline to aphanocrystalline[1]. The lamination of the upper dolomite is crenulated and forms small tepee structures. Laterally, some dolomite units change thickness and the tepee structures are replaced by breccia zones or enterolithic structures. The sand grains are subangular and the rock, with about 50 per cent feldspar, including both potassium-feldspar and plagioclase, has the composition of arkose. Dolomite intraclasts form a subordinate constituent in the sandstone. The dolomite beds are sandy and silty, and show laminar vugs and bird's-eye texture (Fig. 13). The vuggy texture, together with clotted laminae and spherical textures, implies an algal origin for the dolomite. Synaeresis or desiccation cracks and partings between laminae were observed in thin section (Fig. 14). The uppermost part of the carbonate unit is a conglomeratic interval, about 1 m thick, that overlies the laminated carbonates with sharp contact. This interval consists of light green and pink mottled, very finely crystalline dolomite with floating quartz granules and calcitized basaltic pebbles, the latter up to 20 cm in diameter.

[1] Crystal size definition used in this report is that of Folk (1962).

Figure 12. Basal carbonate unit of Strathcona Sound Formation, at east entrance to Powell Inlet (Powell Inlet) where section 16 (Fig. 7) was studied. The rock shown consists of interlaminated sandstone and dolomite (light coloured bands). Small tepee structures are present in the dolomite.

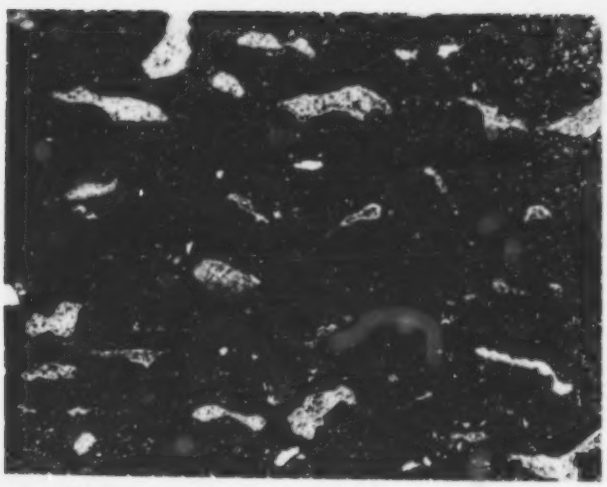

Figure 13. Photomicrograph of sandstone in the basal carbonate unit of the Strathcona Sound Formation. The sand is fine grained and subangular, and has a very finely crystalline dolomite matrix. The clear grains are quartz and plagioclase; the dark grains are stained alkali – feldspar and rare carbonate clasts. Bird's-eye texture suggests an algal origin for the matrix. (C-77331/1, section 16, Fig. 7; composite stratigraphic section C, unit 1.)

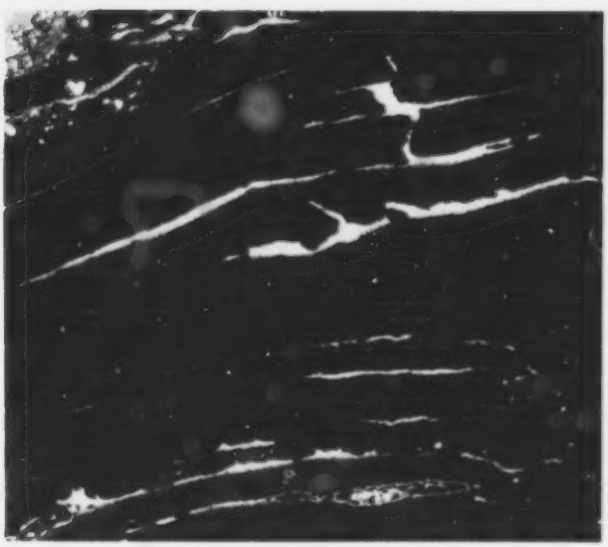

Figure 14. Photomicrograph of dolomite in the basal carbonate unit of the Strathcona Sound Formation. The dolomite is aphanocrystalline to very finely crystalline. Lamination is caused by variation in crystal size and varying amounts of detrital material. A large part of the detrital material is feldspar. The laminae are in part separated or cut by vertical cracks, indicating shrinkage, possibly from syneresis. (C-77331/5, section 16, Fig. 7; composite stratigraphic section C, unit 1.)

2. A grey siltstone unit, about 100 m thick, overlies the basal carbonate unit with a sharp contact. The siltstone unit consists of thin to very thin bedded, greyish green siltstone with some very fine grained sandstone and shale at the top. The bedding is parallel and regular. Internal, fine, parallel lamination is common, while ripple cross-lamination and shallow trough crossbedding were observed in two instances only. In composition, the siltstone is an arkose with the alkali-feldspar content greatly exceeding that of plagioclase. The sandstone, as studied in two samples, appears to contain less feldspar and is in the subarkose range. The siltstone and sandstone exhibit varying amounts (>5%) of clay and calcite cement or have a quartzitic mosaic texture. Subordinate clasts include mica, tourmaline, calcitized feldspar and opaque grains.

3. A red siltstone unit forms the top of the section, and is separated from the underlying unit by a gradational contact. It is 67 m thick. The lower part consists of siltstone and very fine grained sandstone that are very thin bedded to laminated. The upper part is made up of poorly exposed shale. The entire succession has a distinctive dusky red colour. The feldspar contents of the siltstone and sandstone are similar to those of the underlying grey siltstone unit and belong to the arkose and subarkose range, and the amount of alkali-feldspar is similarly much greater than that of the plagioclase. Some feldspars are sericitized, while others exhibit authigenic overgrowth. In contrast to the underlying grey siltstone, the amount of cement and subsidiary minerals is less, whereas mosaic textures are more common. The red colour of these rocks appears to result from films of hematite surrounding quartz grains.

The formation is apparently unfossiliferous, except for a *Rusophycus*-like trace fossil obtained from the grey siltstone unit. A single dyke was found intruding the Proterozoic rocks (Fig. 15). It is about 15 m wide and consists of tholeiitic basalt (see elemental analysis in Appendix III).

Figure 15. *Dyke intruding the Proterozoic Strathcona Sound Formation and overlain nonconformably by lower Paleozoic rocks on the south coast of Devon Island between Powell and Cuming inlets (Station 15,* ***Powell Inlet****). The dyke is about 15 m wide.*

Age

Jackson and Iannelli (1981) have presented evidence that the Eqalulik, Uluksan and Nunatsiaq groups are late Proterozoic (Neohelikian) in age. Radiometric age determination and paleomagnetic poles for volcanic rocks of the Nauyat Formation, which constitutes the base of the Eqalulik Group, indicate an age of about 1130 to 1220 million years. Radiometric age determination and paleomagnetic poles obtained for the dykes suggest an age of about 700 to 750 million years.

Lower Cambrian

Rabbit Point Formation

Definition, distribution and thickness

The oldest Paleozoic formation in the report area is a thin unit of sandstone named the Rabbit Point Formation by Kurtz, McNair and Wales in 1952. The type section is in a small stream bed near the head of Dundas Harbour on the south coast of Devon Island (Figs. 16, 17). The formation outcrops in the map-areas of *Dundas Harbour*, *Powell Inlet*, and *Bear Bay East*. It ranges from zero to about 19 m in thickness.

Contact relations

The Rabbit Point Formation is bounded below and above by unconformities. Throughout most of its area of distribution, the formation lies nonconformably on Precambrian crystalline rocks, but locally, on the south coast of the island (*Powell Inlet*), it lies unconformably on sediments of the Proterozoic Strathcona Sound Formation (Figs. 5, 6). At most places along the Precambrian-Paleozoic contact, the Rabbit Point is overlain unconformably by the Middle Cambrian Bear Point Formation, but in others it is absent, having apparently been bevelled out by erosion at that unconformity. At one locality only, east of Cuming Inlet on the south coast of Devon Island (*Powell Inlet*), erosion at the unconformity between the Bear Point and Cass Fjord formations bevels out the entire Bear Point and thereby causes Cass Fjord rocks to lie directly on the Rabbit Point Formation for a short distance along the coastal cliffs.

Problems of the Rabbit Point Formation

Special problems attend the identification and mapping of the rocks assigned herein to the Rabbit Point Formation:

1. Only the type section of the Rabbit Point at Dundas Harbour has yielded diagnostic fossils and, consequently, the identification of the formation outside of the environs of Dundas Harbour is perforce based on physical stratigraphy only.

2. In view of the foregoing circumstance and the presence of an unconformity at the base of the Bear Point Formation, question arises as to whether some or all of the sections ascribed herein to the Rabbit Point Formation outside of the type section at Dundas Harbour, might not, in fact, represent basal clastic deposits of the Bear Point. Four reasons may be advanced that militate against this possibility: the rocks ascribed herein to the Rabbit Point maintain a gross homogeneity of character throughout their distributive area; they are separated sharply from the overlying Bear Point wherever the contact has been observed; in the environs of Dundas Harbour and Croker Bay, where the Rabbit Point seems to have been established beyond reasonable doubt, the overlying Bear Point does not appear to include a discrete basal sandstone; and this is also true in places where the Rabbit Point is absent, and Bear Point rocks lie directly on Precambrian rocks (see section 23, Figure 7).

3. Although the Precambrian-Paleozoic contact usually can be determined accurately on the ground or from aerial photographs for purposes of mapping (see, for example, Figure 83), the basal few metres of the Paleozoic succession commonly are covered with talus, owing to the greater resistance offered to erosion by the Precambrian crystalline rocks. Because of this circumstance, coupled with the general thinness of the Rabbit Point, it is commonly impossible to determine whether Rabbit Point rocks are present or not along stretches of the Precambrian-Paleozoic boundary. Consequently, it is not possible to say just how sporadic or widespread is the Rabbit Point Formation.

4. Aside from the limitations imposed by the foregoing circumstance, the thinness of the Rabbit Point renders impractical any attempt to depict the formation as a separate entity on the accompanying geological maps. Consequently, the Rabbit Point is included with the overlying Bear Point as a single map unit bearing the symbol and this practice is followed even in places where the Rabbit Point is known to be absent.

Lithology

Eight fairly widely separated sections (1, 3, 13, 16, 12, 14, 22, 18) of the Rabbit Point Formation are shown on Figure 7. Also, the formation was examined cursorily at a dozen or more additional localities within the report area.

According to Kurtz et al. (1932), the type section of the Rabbit Point Formation is 86 feet (26.2 m) thick. This thickness includes, in order upward:

1. A basal covered interval 23.5 feet (7.16 m) thick above the Precambrian crystalline rocks;

2. Lower Cambrian sandstone beds, including two small internal covered intervals, totalling 12.5 feet (3.81 m) thick; and

3. A covered interval 50 feet (15.24 m) thick below the overlying Bear Point Formation.

A somewhat different version of the thicknesses of the foregoing intervals, and interpretation as to what rocks underlie the uppermost covered interval, were determined by the present investigation. The exposure of Rabbit Point sandstone was measured as 11 feet (3.35 m) thick. This figure includes an internal covered interval 4 feet (1.21 m) thick. Separating the base of the sandstone beds from the erosional surface that marks the top of the Precambrian rocks, which is well exposed at this locality, is a covered interval 9 feet (2.74 m) thick. Within this covered interval, as correctly noted by Kurtz et al., are numerous blocks of frost-riven sandstone that are lithologically similar to the Rabbit Point Formation, leaving little doubt that the entire interval is underlain by that formation. The covered interval that occurs stratigraphically above the highest exposure of Rabbit Point sandstone and below the Bear Point Formation is 25 feet (7.62 m) thick. The topographic expression of this covered interval, including the soil and rock-rubble developed on it, seem to indicate that the underlying rocks probably belong to the soft, easily weathered basal limestone and shale member of the Bear Point rather than to the Rabbit Point. It would appear, therefore, that the total thickness of the Rabbit Point at its type locality is only about 20 feet (6.1 m).

What are perhaps the best exposures, and most typical developments of both the Rabbit Point and Bear Point formations in the general vicinity of the type sections of these formations occurs in a stream canyon west of the head of Croker Bay (section 12, Fig. 7; also Fig. 3).

The sandstone of the Rabbit Point is of two main types:

1. The commonest type occurs mainly in thick beds, and is ordinarily medium to coarse grained. The grains are rounded, and sorting is poor or bimodal. Interbeds of granule-sized pebble layers are fairly common. The fresh surface colours are predominantly very light grey and light grey and occasionally red or yellow. The principal weathering colours are shades of grey and yellow. Large scale (up to 40 cm) planar and trough crossbeds commonly characterize this rock type (Fig. 18), and indicate a transport direction from the east and northeast.

2. The second type is predominantly thin bedded, and very fine to fine grained. The grains are rounded and well sorted. Sedimentary structures include ripple marks and desiccation cracks. *Planolites* and *Scolithus* occur in some beds. The principal fresh surface colours are light shades of green, grey or brown.

Characteristics common to both rock types include composition that varies from pure quartzarenite to subarkose with an estimated five per cent feldspar, and weathering colours that are mainly light shades of grey, yellow or green. Most sections are made up entirely of the first described type, while sections in the environs of Dundas Harbour commonly include both types.

Age and correlation

No identifiable fossils were obtained from the Rabbit Point Formation during the course of the present investigations. However, Kurtz et al. (1952) collected *Olenellus* sp. from the type section at Dundas Harbour. The formation therefore equates with the late Early Cambrian *Bonnia-Olenellus* Zone of Fritz (1972).

The Rabbit Point is approximately correlative with Lower Cambrian rock units in Ellesmere Island and northwestern Greenland that are characterized by species of *Olenellus* or correlative forms, though precise correlations are, as yet, not possible (see Table 2; Cowie, 1971). These units include: Police Post and overlying Cape Kent formations in the Arctic Platform of Bache Peninsula, Ellesmere Island; Wolff River and overlying Cape Kent formations in the platform succession of Greenland; and the Kane Basin Formation of the Ellesmere Group in the Franklinian Miogeosyncline north of Bache Peninsula (Kerr, 1967b).

Middle Cambrian

Bear Point Formation

Definition

The Bear Point Formation was named by Kurtz et al. (1952); a unit which they considered consisted mainly of limestone. The type section of the formation is at Dundas Harbour (Fig. 16). It was measured and described from the same series of exposures in which these authors also established the type sections of the Rabbit Point Formation and Ooyahgah Formation, which formations, respectively, underlie and overlie Bear Point rocks. The Ooyahgah Formation will be discussed later. Here it is sufficient to note that all of the beds referred to that formation by Kurtz et al. (*op. cit.*) are assigned herein to the Cass Fjord Formation. According to Kurtz et al., the type section of the Bear Point is 239.57 m (786.0 ft) thick. However, the type section of the Bear Point, as measured and described by Kurtz et al. (*op. cit.*) is redefined here to exclude the upper 163.67 m (537.0 ft) of beds which also are reassigned to the Cass Fjord Formation, leaving the stratigraphically lower 75.89 m (249.0 ft) of the type section in the Bear Point Formation. The grounds for this revision are as follows: the basal unit of the 163.67 m thick interval referred to the Cass Fjord Formation was described by Kurtz et al. (*op. cit.* p. 648) as, "Sandstone, dolomitic, yellowish grey, fine-grained, shaly, thin- and irregularly bedded. Weathers pale yellowish brown. Prominent fucoid markings. . . 3.5 [feet]". This unit of sandstone is readily identifiable in the outcrops at Dundas Harbour and is shown in Figure 26. The base of the sandstone marks an unconformity that separates the Bear Point Formation, as redefined herein, from Cass Fjord rocks throughout Devon Island. In addition, the unconformity is a readily mappable regional contact that separates lithologically different units.

The type section of the Bear Point is shown graphically as section 3 on Figure 7. It consists largely of limestone and dolomite and subordinate amounts of shale. The section is 50.9 m thick, and almost half of it is represented by covered intervals. It seems probable that the covered intervals indicate the presence of significantly more shale than is apparent in exposed parts of the section.

Distribution and thickness

The Bear Point Formation is widely distributed in eastern parts of the report area (*Dundas Harbour, Powell Inlet* and *Bear Bay East*). The formation ranges from about 25 to 86 m in thickness, but it should be noted that at one locality, east of Cuming Inlet (*Powell Inlet*), Bear Point rocks are bevelled out entirely by the unconformity at the base of the Cass Fjord Formation. It seems reasonable to assume that the variable thickness of the Bear Point Formation is due, in part at least, to this unconformity.

Regional lithology and variations

Eleven measured sections (1, 3, 4, 12, 13, 14, 18, 22, 23, 24, 25) of the Bear Point Formation are shown graphically on Figure 7. The sections show the complex lateral and vertical relationships that characterize this formation.

In the environs of Dundas Harbour and Croker Bay (*Dundas Harbour*), the Bear Point is divisible into three informal members that are illustrated best in sections 3 and 4:

1. A lower member, consisting of nodular limestone and shale. The nodular limestone is a medium light grey to medium grey lime mudstone and skeletal wackestone, and commonly weathers to a light grey colour. It is mainly thin bedded, and rarely medium bedded. It occurs either as discrete nodules in shale (figs. 19, 20), or as thin limestone beds with undulating bedding planes and shale partings (Fig. 21). The limestone is slightly dolomitic and locally sandy. Authigenic feldspar in various stages of calcification, as well as glauconite, are sparse constituents. Interbedded with the nodular limestone are rare planar beds of limestone that exhibit labyrinthine dolomitic mottling. The shale is generally poorly exposed, and what shale has been observed is dark grey, variably calcareous and silty. The unit has yielded numerous identifiable trilobites, and fragmentary remains of trilobites and echinoderms are common. In addition, fragments of the problematic fossil *Cambrotrypa* sp. are abundantly represented in some thin sections (Fig. 22). The member is 24.1 m thick in the type section.

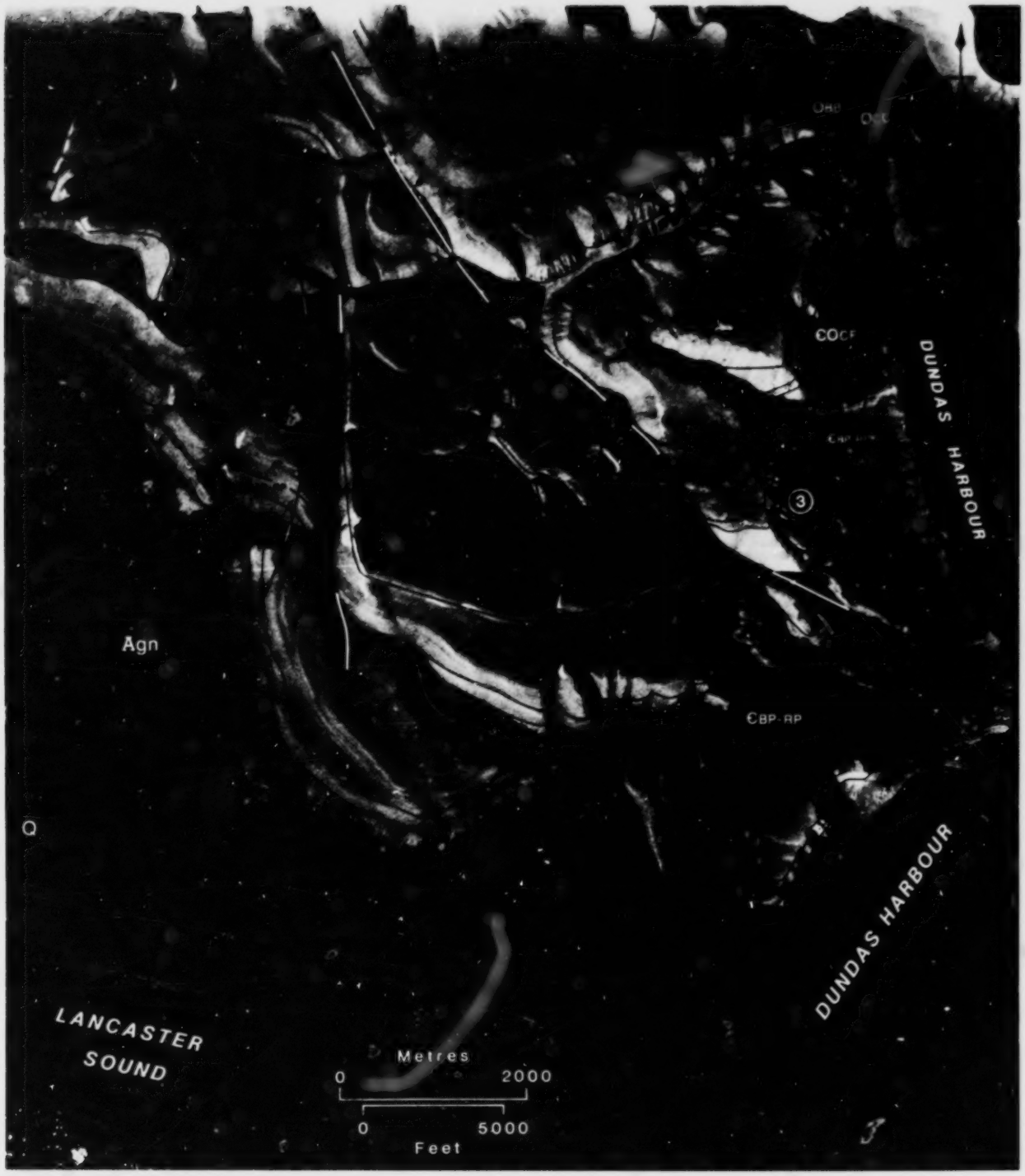

Figure 16. Vertical aerial photograph (A-16784-95) of the Dundas Harbour area on the south coast of Devon Island (Dundas Harbour). The photograph shows the geology of this region, as established by the present study. It also illustrates the topographic and weathering characteristics of the various formations. This is the region where Kurtz et al. (1952) established their Cambrian and Ordovician succession, and the lines with circled numbers 1 to 3 mark the approximate locations of the sections measured and described by these authors. The type sections of the Nadlo Point and Mingo River formations were established by these authors in section 1; the type section of the Croker Bay Formation in section 2; and the type sections of the Rabbit Point, Bear Point, and Ooyahgah formations in section 3. Agn *= Precambrian gneiss;* ЄBP-RP *= Bear Point and Rabbit Point formations, undivided;* ЄOCF *= Cass Fjord Formation;* OCC *= Cape Clay Formation;* OBB *= Blanley Bay Formation;* OE *= Eleanor River Formation;* OCB *= Bay Fjord Formation;* OCTI *= Thumb Mountain and Irene Bay formations, undivided;* OSA *= Allen Bay Formation; and* Q *= Quaternary.*

2. A middle member made up of a uniform succession of medium to thick bedded lime mudstone with labyrinthine dolomitic mottling. The detailed lithology of this unit is similar in most respects to that of the planar beds that occur intermittently in the lower unit. Typically, the unit weathers to greyish orange and yellowish grey. Rare fragments of trilobites were the only organic remains observed in the unit. The unit is 13.7 m thick in the type section.

3. An upper member consisting of dolomite. It is 13.1 m thick in the type section of the Bear Point and, of the three members recognized at that locality, it is the only one that extends throughout the entire areal extent of Bear Point rocks. Moreover, the Bear Point Formation is represented by this member alone throughout most of its distributive area. Physical stratigraphy and mapping have indicated that as the two lower members of the Bear Point in the Dundas Harbour-Croker Bay area are traced to the west and northwest, they give place laterally to dolomitic rocks that are, for all practical purposes, lithologically indistinguishable from rocks of the upper dolomitic member in the Dundas Harbour-Croker Bay area (see Figure 7). It should be stressed that the term upper member is, thus, strictly applicable only to the stratigraphy of the Bear Point Formation in the environs of the type section (*Dundas Harbour* and adjacent parts of *Powell Inlet*), and that elsewhere (*Powell Inlet, Bear Bay East*), this member is synonymous with the Bear Point Formation as a whole.

The member is everywhere mainly thick bedded to massive dolomite that is medium to coarsely crystalline, and hypidiotopic or xenotopic. Weathered surfaces commonly exhibit a labyrinthine mottled texture, and in the lower part of the member the mottling is expressed by slight differences in the size of the crystals. Most beds are slightly silty or sandy, the clastic fractions consisting mainly of angular quartz grains and minor amounts of feldspar and glauconite grains. Original textures have been mostly obliterated by dolomitization but in two instances grainstone texture and intraformational granule conglomerate were discernible in thin sections. Thin units of interbedded dolomitic sandstone and dolomite occur at the base of the member at some localities (see sections 18, 25).

Figure 17. *Type section of Rabbit Point Formation at Dundas Harbour (see Figure 16 for precise location). The uppermost metre or more of beds is shown here. Note hammer for scale.*

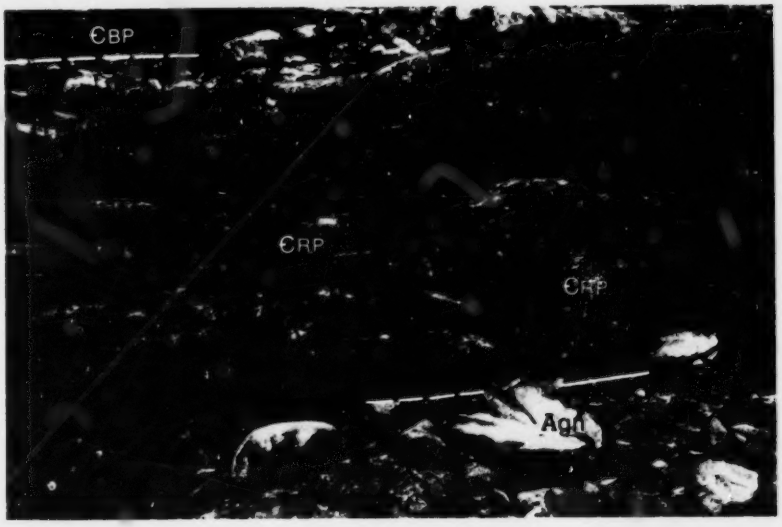

Figure 18. *Crossbedded sandstone of the Rabbit Point Formation (€RP), overlying Precambrian gneiss (Agn) and overlain by the Bear Point Formation (€BP) about 5 km northeast of the upper reaches of Croker Bay (Station 9,* ***Dundas Harbour****). At this locality: shale is almost absent in the lower unit of the Bear Point, which consists mainly of limestone that is in part nodular; fossil collection C-79413 was obtained from the Bear Point, about 10 m above base of the formation; the Rabbit Point, though mainly greyish coloured, includes subordinate amounts of reddish rocks; and the Precambrian crystalline rocks are completely covered by a few centimetres of rock debris where the photograph was taken.*

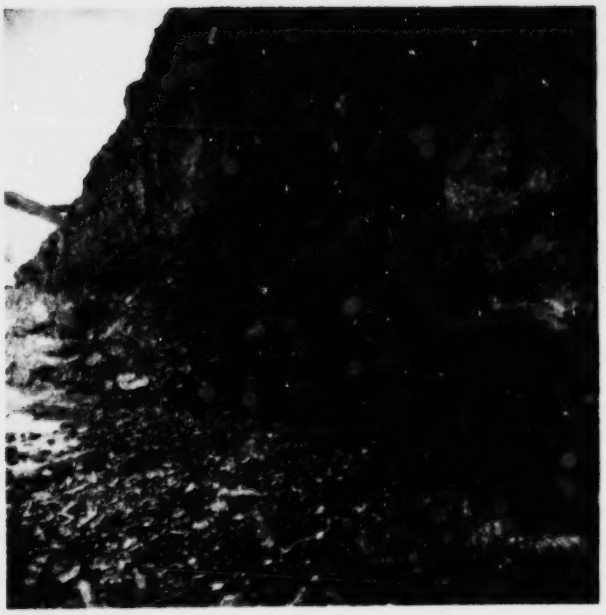

Figure 19. *The Bear Point Formation on the west side of Croker Bay (Station 73), Dundas Harbour, showing the lower nodular limestone and shale member and overlying middle limestone member.*

Figure 20. *Close-up view of the contact between lower and middle members of Bear Point Formation shown in Figure 19.*

Figure 21. *Type section of the Middle Cambrian Bear Point Formation at Dundas Harbour (see section 3, Fig. 7; also Fig. 16 for precise location). Shown here is the basal nodular limestone and shale member, which contains trilobites of the* **Glossopleura** *Zone.*

TABLE 2. Correlation of lower Paleozoic rocks of Devon Island with Cornwallis Island, Ellesmere Island and Northwestern Greenland.

PERIOD	EPOCH	STAGE (EUROPE)	STAGE (NORTH AMERICA)	DEVON ISLAND Arctic Platform	CORNWALLIS ISLAND Franklinian Miogeosyncline	ELLESMERE ISLAND Franklinian Miogeosyncline	ELLESMERE ISLAND Arctic Platform Bache Peninsula	NORTHWESTERN GREENLAND Arctic Platform	Cambro-Ordovician Conodont Faunas	Devonian and Silurian Conodont Zones
DEVONIAN	EARLY	LOCHKOVIAN			SNOWBLIND BAY 450 m+					*pesavis*
				SOPHIA LAKE 250 m+	SOPHIA LAKE 560 - 980 m					*Ozarkodina delta eureksensis*
										hesperius
SILURIAN		PRIDOLIAN		BARLOW INLET 750 m	BARLOW INLET 1410 m	ALLEN BAY - READ BAY (undivided)		Stratigraphy of beds above Alequatsiq Fjord Formation has not been published		uppermost *costenhornensis*
										costenhornensis
										Pelekysgnathus index fauna
										crispa
										latialata
		LUDLOVIAN		DOURO 138 - 238 m	DOURO 335 - 460 m					*siluricus*
				CAPE STORM 431.6 m	CAPE STORM 520 - 670 m					*ploeckensis*
										crassa
		WENLOCKIAN		ALLEN BAY 660 m	ALLEN BAY 1200 - 1375 m					*sagitta*
										patula
										amorphognathoides
		LLANDOVERIAN								*celloni*
										kentuckyensis
				?	?			?		?
ORDOVICIAN	LATE	ASHGILLIAN	GAMACHIAN					ALEQATSIQ? FJORD	13	
			RICHMONDIAN	ALLEN BAY					12	
			MAYSVILLIAN	IRENE BAY 6-18.5 m	IRENE BAY 30 - 45.5 m	IRENE BAY		CAPE CALHOUN		
	MIDDLE	CARADOCIAN	EDENIAN	THUMB MOUNTAIN 55.5 - 140 m	THUMB MOUNTAIN 340 m	THUMB MOUNTAIN		TROEDSSON CLIFF	11	
			BARNEVELDIAN						9/10	
			BLACKRIVERIAN					GONIOCERAS BAY	8	
			?						6.7	
		LLANDEILIAN	CHAZYAN	BAY FIORD 128 - 350 m	BAY FIORD 440 m	BAY FIORD		CAPE WEBSTER	5/6	
		LLANVIRNIAN							3,4	
			WHITEROCKIAN						2	
								NUNATAMI	½	
	EARLY	ARENIGIAN	CANADIAN	ELEANOR RIVER 151 - 200 m	ELEANOR RIVER 700 m	ELEANOR RIVER	ELEANOR RIVER	CANYON ELV	E/1	
								NYGAARD BAY	D	
				BLANLEY BAY 98-175 m	BAUMANN FIORD 750 m	BAUMANN FIORD	BAUMANN FIORD	POULSEN CLIFF	?C	
					Unnamed formation 290.8 m		Map unit 6	CHRISTIAN ELV	C	
		TREMADOCIAN		CAPE CLAY 65 m	CAPE CLAY 87 m		CAPE CLAY	CAPE CLAY		
				CASS FJORD 270 - 335 m	CASS FJORD 2176.2 m+	COPES BAY	CASS FJORD	CASS FJORD	B	
									A	
CAMBRIAN	LATE		TREMPEALEAUAN							
			FRANCONIAN							
			DRESBACHIAN			? PARRISH GLACIER				
	MIDDLE			BEAR POINT 25 - 86 m		?SCORESBY BAY	CAPE WOOD	CAPE WOOD		
	EARLY			RABBIT POINT 0-20 m		ELLESMERE GROUP	CAPE KENT	CAPE KENT		
							POLICE POST	WULFF RIVER		
							CAPE INGERSOLL	CAPE INGERSOLL		
							CAPE LEIPER	CAPE LEIPER		

GSC

Two contrasting sets of fresh surface colours characterize the member. Most beds are medium dark grey to dark grey and these colours commonly exhibit a slight brownish tinge. On the other hand, many sections have one or more intervals of beds, up to 3 m or more in thickness, that are very light grey or pinkish grey, and that do not appear to occupy any consistent level within the unit. An outstanding characteristic of the member is its weathering colours. Although vertical sections commonly weather to drab grey colour on sloping surfaces and near-vertical sections, the light and dark coloured rocks alike weather to a uniform moderate reddish orange or pale reddish orange. The member is topographically prominent (Fig. 84), and probably contains the most resistant sedimentary rocks in the report area. It is apparently unfossiliferous.

Worthy of special notice, but studied only briefly, is a section including the Rabbit Point Formation and the lower part of the Bear Point Formation high in the sea cliffs near the head of Cuming Inlet (Station 72, *Powell Inlet*). There, about 3.5 m of typically developed Rabbit Point sandstone is separated by a covered interval 3 m thick from an overlying unit of soft weathering oolitic hematite that is 0.5 m thick. Moreover, the nature of the soil and debris that form the covered interval suggests that most or all of the interval is underlain by hematite. The outcrop of hematite is overlain abruptly by a uniform succession of nodular dolomite that is variably silty, greyish green, finely crystalline, very thin bedded and 5.2 m thick. This dolomite is in turn succeeded gradationally by what appears to be a uniform sequence of mainly thick bedded to massive dolomite estimated to be 40 m thick, and typical of the upper dolomitic member of the Bear Point Formation, described earlier. However, it should be noted that these observations concerning the upper 40 m of dolomite are largely guesswork because these rocks occur in cliffs of which only the basal 2 m could be examined. Although the two sequences of dolomite described above are most reasonably assigned to the Bear Point, the same is not necessarily true of the hematite, which could belong to the Rabbit Point, or, in view of the Rabbit Point-Bear Point unconformity, belong to a separate episode of deposition that is unrelated to either formation. In section 16, however, a thin bed of sandstone with hematite cement occurs within the Rabbit Point Formation.

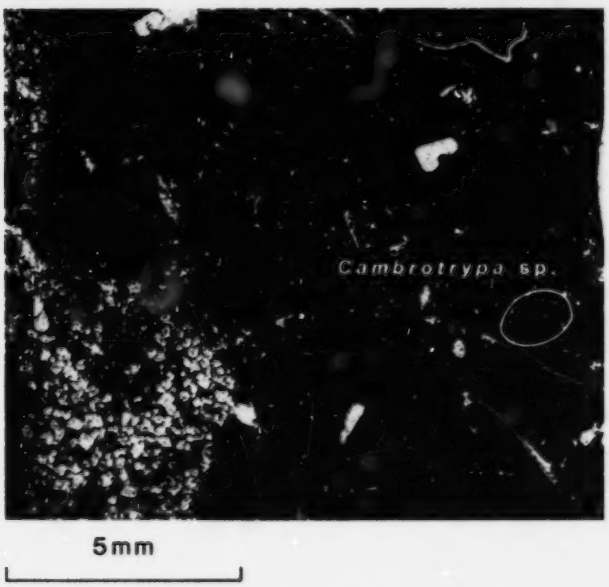

Figure 22. *Photomicrograph of limestone from the lower member of the Bear Point Formation. The rock is a sandy and dolomitic skeletal wackestone. The detrital material is very fine grained and consists of quartz and various feldspars. The skeletal material is derived from brachiopods, crinoids, trilobites, and* **Cambrotrypa** *sp. Euhedral dolomite crystals are present in the light coloured area at the left lower corner of the photograph; this area may represent a burrow. (C-77032, section 3, Fig. 7.)*

Age and correlation

The age of the Bear Point is Middle Cambrian. Evidence for this conclusion comes entirely from trilobites collected in the environs of Dundas Harbour and Croker Bay. The faunas are listed below:

Section 3

GSC loc. C-77042; 10.6 m above base of formation

Glossopleura sp.

GSC loc. C-77041; 11.5 m above base of formation

Vanuxemella sp.

GSC loc. C-77030; 11.9 m above base of formation

Glossopleura sp.
Paterina sp.

GSC loc. C-77031; 12.1 m above base of formation

Glossopleura sp.
Paterina sp.

GSC loc. C-77033; 15.6 m above base of formation

Glossopleura sp.
Paterina sp.
Vanuxemella sp.
undetermined ptychoparioid

Section 4

GSC loc. C-77330; 49.5-50.4 m above base of formation

Ehmaniella sp.

Station 9

Dundas Harbour

GSC loc. C-79413; estimated 10 m above base of formation

Glossopleura sp.
Polypleuraspis sp.

The above identifications are by W.H. Fritz who assigns collection C-77330 tentatively to the *Bathyuriscus - Elrathina* Zone because of the presence of *Ehmaniella* sp., and all of the other Bear Point collections to the underlying *Glossopleura* Zone. Although evidence of Middle Cambrian faunas older than the *Glossopleura* Zone was not found in the Bear Point during the present investigation, it should be noted that Kurtz et al. (1952) reported that their stratigraphically lowest fauna from the formation contained the genus *Dolichometopsis* associated with representatives from the *Albertella* Zone, a zone that underlies the *Glossopleura* Zone and overlies the *Plagiura - Poliella* Zone, at the base of the Middle Cambrian. Cowie (1971), in commenting on this report by Kurtz et al. (*op. cit.*), noted that, while these authors had not published a description of their Bear Point faunas, *Dolichometopsis* has been known to occur with ollenelids, which raises the possibility that the Bear Point Formation might include beds as old as Early Cambrian. This problem remains unresolved; however, the Bear Point is provisionally considered herein as embracing Middle Cambrian strata only.

The Bear Point is correlative with the Cape Wood Formation in the Arctic Platform succession of northwestern Greenland and Bache Peninsula in Ellesmere Island. In Greenland, the formation has yielded trilobites indicative of the *Glossopleura* and *Bathyuriscus - Elrathina* Zones, and a basal conglomerate of the formation has also yielded species of *Fieldaspis, Amecephalus* and *?Kochaspis*, suggesting the *Plagiura - Poliella* Zone. However, Cowie (1971) suggested that the latter trilobites may be *remanié* fossils from beds now reduced to rubble by an interval of erosion, and should, therefore, not be considered as representing a zone of the Cape Wood. Moreover, as noted also by Cowie (*op. cit.*), the period of erosion apparently persisted for the duration of the *Albertella* Zone, which is not represented in northwestern Greenland. The Cape Wood at Bache Peninsula has also yielded trilobites of the *Blainiopsis* faunule (=*Glossopleura* and *Bathyuriscus-Elrathina* Zones) (Cowie, *op. cit.*).

In the Franklinian Miogeosyncline to the north and northwest of Bache Peninsula is a prominent unit of dolomite, up to 860 m thick, that has been named the Scoresby Bay Formation by Kerr (1967b), and was dated as Early Cambrian on the basis of a single collection of trilobites that indicated a correlation with the *Bonnia – Olenellus* Zone. The Scoresby Bay overlies the Kane Basin Formation, which also includes the *Bonnia – Olenellus* Zone, and it underlies the Parrish Glacier Formation that has yielded a single Middle Cambrian genus identified as cf. *Clavaspidella* sp. Lithologically, the Parrish Glacier appears to correlate with the lower part of the Cass Fjord Formation in Devon Island, Bache Peninsula and Greenland, and the recent report by Henriksen and Peel (1976) that the Cass Fjord in Greenland includes beds as old as Middle Cambrian, adds further support to this correlation. Thus, on the bases of lithological similarities and stratigraphic position, the Scoresby Bay would seem to be correlated with the Cape Wood Formation in the platform succession in Bache Peninsula. Furthermore, the single collection of Early Cambrian fossils reported to have come from the Scoresby Bay Formation was obtained from a succession of Cambrian rocks in the extreme northwestern part of the distributive area of miogeosynclinal Cambrian rocks (see section 18, in Kerr, 1967b), where the various Cambrian formations cannot be related with complete certainty to those farther to the northeast. Consequently, the rocks identified as the Scoresby Bay in Kerr's section 18 may not be that formation. Because of these circumstances, the Scoresby Bay is provisionally correlated herein with the Cape Wood and Bear Point formations (see Table 2).

Middle Cambrian to Lower Ordovician

Cass Fjord Formation [1]

Definition

The name Cass Fjord from Washington Land of northwestern Greenland was proposed by Poulsen (1927, p. 245) for "a series of coarse conglomerates with interbedded, thin, grey limestone layers which are rather rich in clay substance". According to Poulsen (*op. cit.*), the Cass Fjord is late Ozarkian in age and is interposed between the overlying Cape Clay Formation, to which he also assigned a late Ozarkian age, and the underlying Cape Frederik VII Formation of early Ozarkian age. Poulsen's (*op. cit.*) study is mainly concerned with the systematic description of Cambrian and Early Ordovician faunas collected by Lauge Koch in northwestern Greenland, and his definitions and descriptions of the various Paleozoic formations in that region were based on information provided to him by Koch. Later, Koch (1929a, 1929b) gave a somewhat fuller account of the lithology and distribution of these formations. In 1950, Troelsen was able to show that, on the basis of similarities in lithology and stratigraphic position to beds in Greenland, the Cass Fjord Formation is present in Bache Peninsula, Ellesmere Island. He also rejected the Cape Frederik VII Formation as spurious, considering it instead as representing the uppermost part of the Middle Cambrian Cape Wood Formation, which underlies the Cass Fjord. Christie (1967, p. 34) followed Troelsen's (*op. cit.*) lead in applying the name Cass Fjord to beds in Bache Peninsula, which he described as comprising "mostly grey-weathering, platy limestone, dolomitic limestone, and intraformational conglomerate . . . Algal and gypsiferous beds lie scattered in the upper half of the section". A section of Cass Fjord rocks in Bache Peninsula described in detail by Christie (*op. cit.*) is 487.68 m thick.

[1] The formation has been spelled variously in the literature as Cass Fiord and Cass Fjord. The correct spelling of the name is Cass Fjord because that is the spelling used by Poulsen (1927). Moreover the spelling of the topographic feature for which the formation was named is Cass Fjord.

The most comprehensive description of the Cass Fjord Formation presented to date for northwestern Greenland is contained in a preliminary report of field studies conducted in 1975 by Henricksen and Peel (1976). This report is particularly pertinent to the present account for two reasons:

1. The described characteristics of the Cass Fjord, with one notable exception, show several striking similarities in lithological characteristics and sequence of gross lithologic units with the formation as described herein for Devon Island. The exception is that the Cass Fjord consists almost entirely of limestone in Greenland and almost entirely of dolomite on Devon Island.

2. Henricksen and Peel were able to show for the first time that the Cass Fjord ranges from Middle Cambrian to Early Ordovician.

According to Henricksen and Peel (*op. cit.*), the thickness of Cass Fjord rocks in northwestern Greenland is about 470 m.

Distribution and thickness

The Cass Fjord Formation is widely distributed in eastern parts of Devon Island, particularly in *Dundas Harbour*, *Powell Inlet* and *Bear Bay East*. In addition, limited outcrops of the formation occur in parts of southeastern *Maxwell Bay* and northeastern *Bear Bay West*. Ranging in thickness from about 270 to 355 m, the formation appears to thin toward the west, a seemingly anomalous situation in view of the fact that several other lower Paleozoic formations within the report area thicken in that direction. However, the westward thinning of the Cass Fjord appears to result mainly from a reduction in that direction of the proportion of sandstone in the upper part of the formation. Furthermore, in view of the fact that the formation is more than 2176 m thick in the Panarctic Deminex Cornwallis Central Dome K-40 well on Cornwallis Island, Cass Fjord strata may be expected to thicken markedly in a westerly direction, in the subsurface of western Devon Island.

Lithology

Four measured sections (3, 14, 24, and 17/18) of the Cass Fjord Formation are shown on Figure 8. A four-part subdivision of the formation is evident throughout the report area. The subdivisions are designated, in ascending order, members A, B, C and D.

Member A makes up about half of the total thickness of the formation. The member is moderately resistant, and because the overlying member is recessive, the upper contact is commonly well marked in the topography, especially in cliff sections (Fig. 23). Member A consists principally of dolomite and interbedded flat-pebble conglomerate with subordinate amounts of shale[1] and sandstone. The dolomite is mainly medium to dark grey, and less commonly various light shades of green and rarely purple. It is mostly planar bedded, and occurs mainly in very thin to thin beds, but also includes lesser amounts of medium to thick beds. The dolomite varies from aphanocrystalline to medium crystalline, but is mainly finely crystalline, and hypidiotopic or xenotopic. It is, moreover, commonly impure. X-ray diffraction analysis of two samples indicates a maximum of 16 per cent feldspar and 20 per cent quartz, and illite occurs in one sample. Most of the feldspar appears to be authigenic. It is present as perfect prisms up to 0.1 mm in diameter. The feldspar tends to be concentrated along laminae. Some of the prisms are partially replaced by dolomite or enveloped by poikilotopic dolomite crystals. Other clastic components include mica flakes, glauconitic grains and rare, heavy minerals. In addition, some of the xenotopic dolomite may be detrital.

The intraformational conglomerate (flat-pebble conglomerate) (figs. 24, 25) occurs mainly in thin to medium beds with sharply defined lower and upper boundaries, and exhibits no vertical size gradation. The clasts are generally less than 0.5 cm in their shortest dimension, but may range up to 10 cm in their longest dimension. They consist of finely crystalline dolomite that is commonly silty. The cement is usually medium crystalline dolomite. The borders of the clasts are variably defined. Where best defined, they exhibit opaque rims, which appear to consist of iron oxide, and pits and cavities, which are interpreted as solution features. In addition, there is commonly evidence of pressure solution between individual pebbles. Some weakly defined clasts are apparent only by virtue of a sharp change in the size of crystals between pebbles and cement, accentuated in some instances by solution lines or faintly brownish rims.

The shale occurs as bedding plane partings and as sparse intervals up to a few centimetres in thickness. Compositionally the shale is very finely crystalline, silty dolomite.

Thin interbeds of sandstone constitute an incidental part of this member in sections 24 and 17/18. The sandstone is mainly fine grained, thin bedded and dolomitic.

As noted in an earlier discussion, the contact of the Cass Fjord with the Bear Point Formation is an unconformity, and in most places where the actual contact has been observed, the base of the lower unit is marked by quartz sandstone that is commonly glauconitic and ranges from a few centimetres to 3 m in thickness. The sandstone at the base of member A in section 3 is a case in point, and more or less typical. It is about 0.9 m thick and is light grey, very fine grained, thin bedded, laminated and glauconitic (Fig. 26). A basal sandstone is, however, absent at Station 10 (see Figure 83), and there the base of unit 1 is a bed of flat-pebble conglomerate lying directly on Bear Point rocks (Fig. 27).

Small-scale sedimentary structures characterize the dolomite and sandstone beds throughout the lower unit. They include flaser bedding and ripple crossbedding, desiccation, and synaeresis cracks. Also, some sandy units exhibit low angle, planar crossbeds, and one instance of herringbone crossbedding was observed.

The member is apparently devoid of identifiable megafossils. A dolomitized oolitic grainstone contains some coated clasts with cores that appear to be skeletal fragments. Stromatolites are rare; only small, discrete and linked stromatolites, up to 2 or 3 cm in diameter, were observed. The only other traces of life seen were burrows, mainly *Planolites* sp.

[1] The term shale as used in this report is a field term and applies to finely laminated, generally recessive and fissile weathering rocks.

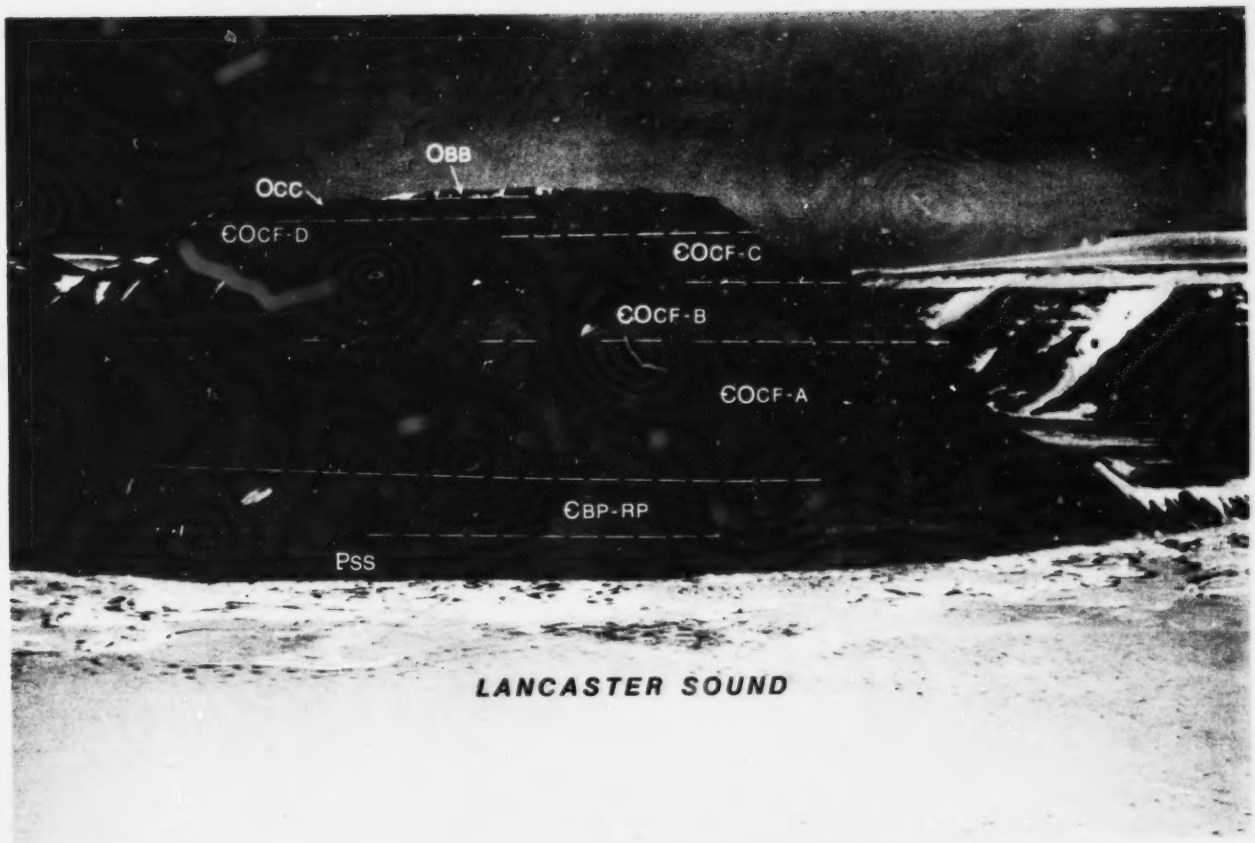

Figure 23. *Sea cliffs on the south coast of Devon Island at the west entrance to Powell Inlet (**Powell Inlet**). View is to the northeast. Strathcona Sound Formation* (PSS); *Rabbit Point and Bear Point formations* (ЄBP-RP); *Cass Fjord Formation* (ЄOCF; *A, B, C, D indicate members in the formation*); *Cape Clay Formation* (OCC); *and Blanley Bay Formation* (OBB).

The overall weathering colour of member A, as observed in cliff sections, is generally light shades of grey and brown, but on gently sloping terrain and in some cliff sections, the member tends to weather to moderate orange-pink or light red.

Member B, which occurs in about the middle of the formation, is mainly easily weathered shale with minor amounts of dolomite and gypsum. Like member A, it is usually easily recognized in well exposed sections of the formation (Fig. 23). The shale is medium grey to greyish green, and commonly weathers to a uniform light grey colour. X-ray diffraction analyses of the shale indicate that it consists principally of dolomite, with varying amounts of quartz and feldspar. The dolomite that is interbedded in the shale is commonly medium grey, very finely crystalline and very thin to thin bedded. Lenses of nodular gypsum occur in this unit in section 3. In places, gypsum is interlaminated with shale, and in such cases the rock displays papery thin fissility. Minor amounts of flat-pebble conglomerate occur in section 24. Eighteen large stromatolitic bioherms occur in the shale in sections 24 and 17. The bioherms are up to 8 m high and 20 m wide, and exhibit a sedimentary relief that varies from 0.5 to 1.5 m. Features such as hematite coating and recrystallization of the upper surfaces of the stromatolites, including solution pipes, seem to indicate subaerial exposure of the bioherms following sedimentation. Only one instance of desiccation cracks was observed, and it occurred in the upper part of the member; otherwise, the member appears to be devoid of sedimentary structures. No megafossils were observed.

Member C includes dolomite and sandstone. It is moderately resistant, but includes both resistant and easily weathered units and, therefore, presents a distinctly ribbed appearance in cliff sections, particularly as viewed from a distance (Fig. 23). For purposes of description, it is convenient to subdivide the member into three parts.

The lower part is mainly resistant dolomite. It was studied only at two localities, which exhibit somewhat different lithologies. At Dundas Harbour (section 3), the rocks consist of very thin to thin bedded, greenish grey dolomite that is finely to medium hypidiotopic crystalline and slightly sandy and silty. The noncarbonate fraction is mostly quartz, but detrital alkali-feldspar (including microcline) and very rare mica flakes are present also. The dolomite becomes increasingly sandy in sequentially higher beds. On the north coast of Devon Island (section 24), this part of the member consists of dolomite and minor amounts of interbedded sandstone. The dolomite is medium crystalline, medium bedded, sandy and oolitic. Cross-stratification and desiccation cracks are present in the sandstone.

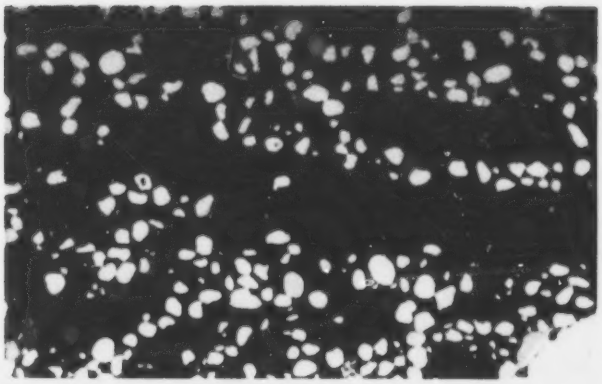

Figure 24. Photomicrograph of intraformational conglomerate from member A of the Cass Fjord Formation. This lithology consists of flat pebbles of finely crystalline dolomite in a matrix of mature, coarse grains of quartz. Some pebbles are silty. The cement is finely crystalline dolomite. Pebbles and cement boundaries are subtle, and expressed as slight changes in crystal size, or as a faint (?)hematite stain along the borders of pebbles. (C-77295, section 18, Fig. 8; composite stratigraphic section D, unit 19.)

Figure 25. Photomicrograph of intraformational conglomerate from member A of the Cass Fjord Formation. Pebbles and cement in this conglomerate consist of medium crystalline dolomite. Some pebbles are silty. Pebbles are well outlined by (?)hematite rinds, and some pebbles show pressure solution. (C-77296, section 18, Fig. 8; composite stratigraphic section D, unit 29.)

The middle part of the member consists of interbedded sandstone and carbonate rocks. The sandstone exhibits various light shades of grey and yellow, is commonly medium bedded, and medium to coarse grained. The clasts are mainly rounded quartz grains with thin quartz overgrowths; there are smaller amounts of carbonate clasts, mainly in the form of dolomitic coated grains. The quality of sorting varies from bed to bed; in some instances, the size distribution is distinctly bimodal (Fig. 28) or characterized by floating granules. Moreover, the ratio of quartz to carbonate grains may vary to the extent that sandy dolomitic grainstone with coated grains and possibly algal fragments is an end member (Fig. 29). Ripple marks and planar crossbeds are the dominant sedimentary structures. The interbedded carbonate rocks are more abundant in the western than in the eastern parts of the distributive area of the formation. They comprise mostly thin bedded, oolitic grainstone and packstone, or sandy dolomite containing stromatolites.

The upper part of the member comprises dolomite and shale, occurring in about equal proportions with subordinate amounts of sandstone. The dolomite is mostly thin bedded, silty, finely crystalline, xenotopic, and probably detrital in origin. The shale is silty, and is also dolomitic in composition. The sandstone is similar in lithology to that of the middle part of the member. Locally, the three rock types described above appear to be arranged in coarsening-upward cycles.

The dominant weathering colours of this member, particularly as viewed from a distance, are various light shades of grey, yellow, and brown.

Member D is made up largely of dolomite, with minor amounts of interbedded flat-pebble conglomerate, and dolomite with a grainstone texture. The dolomite is mainly medium grey, finely crystalline and medium bedded, but it also includes beds that range from very thin bedded to massive, and others that are laminated. Some of the beds of flat-pebble conglomerate are lenticular and a vague upward fining in clast size is evident. Near the top of the member, which is shown in section 3, is a unit of thick bedded, mottled, lime mudstone in which the mottles are formed by calcite after dolomite euhedrons. In addition, authigenic feldspar is present in the lime mudstone. Member D has yielded sparse and unidentifiable remains of gastropods, brachiopods and trilobites.

The member is moderately resistant and commonly forms cliffs, though this is partly due to the extreme hardness of the overlying Cape Clay Formation. Moreover, in cliff sections member D is, in places, difficult to differentiate from the Cape Clay, except on close inspection (figs. 30, 81). The principal weathering colours of the member, particularly as viewed from a distance, include various shades of grey and brown.

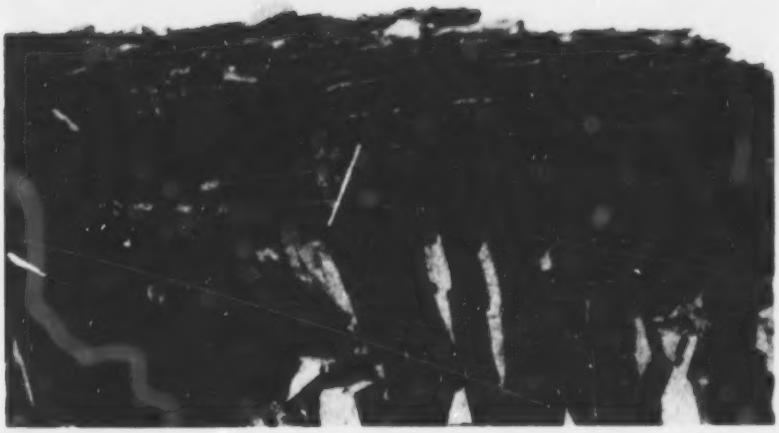

Figure 26. Disconformable contact between the Bear Point Formation and overlying Cass Fjord Formation at the type section of the Bear Point at Dundas Harbour. The head of the hammer lies on the contact that separates thick bedded, vertically jointed dolomite of the Bear Point from a unit of very thin to thin bedded sandstone, about 1 m thick, at the base of the Cass Fjord. This sandstone is considered to represent the same unit of sandstone described by Kurtz et al. (1952, p. 648) as occurring within the Bear Point, 163.68 m (537 ft) below the top of the formation.

Figure 27. Bear Point dolomite overlain disconformably by the Cass Fjord Formation, about 7 km northeast of the east side of Sverdrup Inlet on northern Devon Island (Station 10; Bear Bay East). Helicopter is stationed on the contact. About 15 m of Cass Fjord beds are exposed here. They consist mainly of thin bedded dolomite with minor limestone and shale, and include 17 well spaced interbeds of flat-pebble conglomerate, ranging from about 10 to 50 cm thick. One of the units of flat-pebble conglomerate lies directly on the Bear Point Formation. This is the only locality on Devon Island where quartzose clastic rocks were not observed at the base of the Cass Fjord Formation.

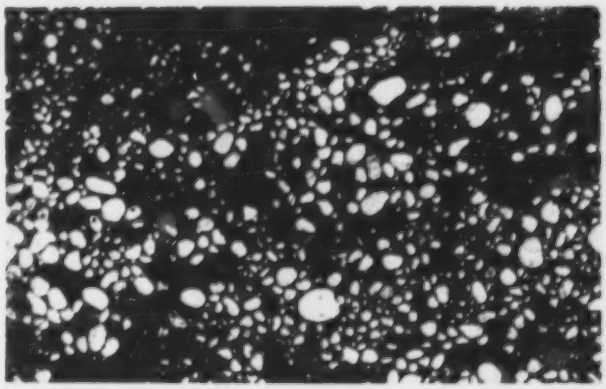

Figure 28. Photomicrograph of sandstone from the middle part of member C of the Cass Fjord Formation. This is a bimodal fine to coarse grained dolomitic sandstone. The larger quartz grains are well rounded, whereas smaller ones are subangular; rare carbonate clasts are also present. The matrix is finely crystalline dolomite, which may be of detrital origin. (C-77312, section 3, Fig. 8; composite stratigraphic section A, unit 48.)

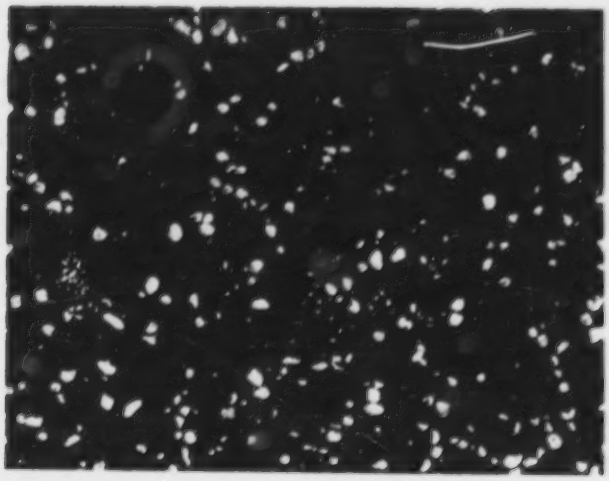

Figure 29. Photomicrograph of dolomite in the middle part of member C of the Cass Fjord Formation. This is a sandy, medium crystalline dolomite. The original texture is preserved and consists of coarse grained grainstone with ooids, compound coated grains, and coated skeletal fragments. The quartz grains are rounded and coarse grained. (C-77310, section 3, Fig. 8; composite stratigraphic section A, unit 44.)

*Figure 30. Contact between the Cass Fjord (CPCF) and Cape Clay (OCC) formations on the south side of the major stream that flows into southern Sverdrup Inlet (visible in background) on the north coast of Devon Island (Station 57; **Bear Bay East**). View is to the northeast. Note the contrast between the mainly thick bedded to massive character of Cape Clay rocks and the dominantly thin to medium bedded character of the upper resistant member of the Cass Fjord. In this region the Cape Clay forms the rimrock along many of the valleys.*

Age

The only diagenetic fossils collected in Cass Fjord rocks in the report area are conodonts, and all of these were obtained from members C and D. The collections are listed. Identifications and age determinations were made by G.S. Nowlan.

Section 3

GSC loc. C-77314; 12.5 m above base of member D

Clavohamulus cf. *C. elongatus* Miller
Cordylodus sp.
Eoconodontus notchpeakensis (Miller)

Remarks: All of these species are indicative of Fauna A (Ethington and Clark, 1971). The specimen compared to *C. elongatus* is much smoother than typical representatives of the species. *C. elongatus* defines the *C. elongatus* Subzone of the *Cordylodus proavus* Zone (Miller, 1978; 1980). The sample is of Early Ordovician age.

Section 24

GSC loc. C-77066; 42.8-52.7 m above base of member C

Teridontus nakamurai (Nogami)

Remarks: This is a cosmopolitan species known from several parts of North America, northern Greenland, Iran, the Soviet Union, Korea, and Australia (for details of distribution, see Miller, 1980). It ranges in age from Franconian (Late Cambrian) through to Early Ordovician (Fauna B of Ethington and Clark, 1971). In North America, it occurs rarely in Late Cambrian time and is most common in strata equivalent to the *Cordylodus proavus* Zone (latest Cambrian to Early Ordovician). Elsewhere in the Canadian Arctic Islands, this species is known from upper Cass Fjord and lower Cape Clay strata (Nowlan, 1976, 1985). Thus, the sample may be of Late Cambrian or Early Ordovician age.

GSC loc. C-77067; 1.5 m above base of member D

Cordylodus proavus Miller
Semiacontiodus nogamii Miller
Teridontus nakamurai (Nogami)
Utahconus sp.

Remarks: The biostratigraphic significance of *T. nakamurai* has been discussed under sample C-77066. *C. proavus* is indicative of Fauna A (Ethington and Clark, 1971) and the *C. proavus* Zone of latest Cambrian to Early Ordovician age (Miller, 1978; 1980). *S. nogami* is known from strata of Early Ordovician age associated with trilobites of the *Missisquoia typicalis* Subzone and the *Symphysurina brevispicata* Subzone. It is known from the upper part of the *C. proavus* Zone (Miller, 1980). The taxa present in this sample indicate an Early Ordovician (early Canadian) age.

[1]See discussion under heading of Correlation, p. 32.

GSC loc. C-77069; 2.2-12.7 m above base of member D

Cordylodus oklahomensis Muller
Teridontus sp.
"Scolopodus" cf. *"S." bassleri* (Furnish)

Remarks: *C. oklahomensis* is a common component of Fauna A, locally ranging into Fauna B (Ethington and Clark, 1971), of Early Ordovician age (Tremadocian). The elements referred to *"S."* cf. *"S." bassleri* are similar to a species which is common in Fauna C of Ethington and Clark (1971); however, the ornament and symmetry transition between elements are less well developed in the specimens of this sample. The forms may be evolutionary ancestors of elements belonging to *"S." bassleri* s.s. The sample is thus of Early Ordovician age (early Canadian), possibly equivalent to Fauna B.

The foregoing collections suggest that no part of the Cass Fjord is younger than Fauna A or possibly Fauna B of Ethington and Clark (1971), a suggestion that is afforded further credence by the fact that the overlying Cape Clay Formation indicates Fauna C only. On this evidence, the top of the Cass Fjord is early Canadian (Tremadocian) in age. Two faunas of Late Cambrian age obtained from Cass Fjord rocks in the Canadian Arctic outside of Devon Island are worthy of special mention here:

1. A collection of conodonts was gathered by Thorsteinsson in 1977 on the east side of Makinson Inlet in southeastern Ellesmere Island. The precise geographic location is UTM Zone 17X, 492900E, 8599400N. The collection (C-76039) was obtained from a bed of limestone about 180 m below the top of the Cass Fjord. The faunas, as determined by C.R. Barnes, include *Proconodontus muelleri muelleri* Miller, and *Coelocerodontus*? sp. With regard to the age of the fauna, Barnes remarks as follows: "In collections from northwestern Devon Island, Nowlan (1976) found that *P. muelleri muelleri* occurred in the upper part of the Parrish Glacier Formation[1], and Member 1 and the lowest part of Member 2 of the Copes Bay Formation. The *P. muelleri muelleri* Zone occurs in the lowest part of Fauna A of Ethington and Clark (1971) and indicates a Late Cambrian (Trempealeauan) age. The species is known to range into the lowest Ordovician".

2. Two collections of trilobites were obtained from core samples in the Panarctic-Deminex Cornwallis Central Dome K-40 well on Cornwallis Island and contain the following forms, as identified by W.H. Fritz (in Brideaux et al., 1975).

GSC loc. C-29842; 2174.7 m from top of Cass Fjord Formation

Corynexochid trilobite
Ankoura? sp.
Age: probably Late Cambrian, tentatively Dresbachian

GSC loc. C-29843; 2175.9-2176.3 m from top of Cass Fjord Formation

Corynexochid trilobite
Ankoura? sp.
Eurekia-like free cheek
Age: probably Late Cambrian, tentatively Dresbachian

Fritz's comments concerning these collections are as follows: "Corynexochid trilobites are rare in rocks younger than Middle Cambrian. The *Ankoura*? sp. has many features that commonly are seen on trilobites of the early Late Cambrian *Cedaria-Crepicephalus* Zone. GSC locality C-29843 contains two free cheeks resembling those of the late Late Cambrian genus *Eurekia*".

The Cass Fjord Formation in the Canadian Arctic Archipelago is here tentatively considered to include beds of Middle Cambrian age and, therefore, to have a total age span of Middle Cambrian to Early Ordovician. That the formation is in part Middle Cambrian in age is based on a preliminary geological report by Henricksen and Peel (1976, p. 21) that includes a discussion on the age of the Cass Fjord in northwestern Greenland. Their comments on this subject are as follows: "Poulsen (1927) described an Early Ordovician fauna with *Hystricurus* from the upper part of the Cass Fjord Formation. On this basis it has commonly been assumed that the entire formation is of similar age. However, preliminary examination of our fossil collections indicates that at least half of the formation should be referred to the Middle and Late Cambrian. The undescribed Late Cambrian faunas collected by geologists of the Greenarctic Consortium, recorded by Dawes (1976), seem to have been derived from near the middle of the formation. Preliminary identifications of our fossil collections by Dr. A.R. Palmer (Stony Brook, written communication, 1976) indicate the presence of strata of Dresbachian (*Crepicephalus* Zone) and Trempealeauan ages".

Correlation

In 1952, Kurtz et al. established the Ooyahgah Formation for a unit of mainly dolomitic limestone, sandstone and shale, 169.0 m (554.5 ft) thick, that was interposed conformably between the top of the Bear Point Formation and the base of the Mingo River Formation (Fig. 16). All of the beds ascribed by these authors to the Ooyahgah Formation are herein considered to belong to the Cass Fjord Formation, which has priority. It should be noted, however, that the Cass Fjord on Devon Island does not equate one for one with the Ooyahgah. It will be recalled from an earlier discussion that the upper 163.67 m (537.0 ft) of beds in the type section of the Bear Point Formation, as defined by Kurtz et al., are considered by the present authors as belonging to the Cass Fjord Formation. Furthermore, the Cass Fjord at Dundas Harbour comprises beds in addition to this 163.67 m (537.0 ft) interval plus the 169.7 m (554.5 ft) thickness assigned by Kurtz et al. to the Ooyahgah Formation. It appears to also include the lower six units of limestone and shale that total 21.79 m (71.5 ft) in the basal part of the Mingo River Formation, as defined and described by Kurtz et al. (*op. cit.*) at Dundas Harbour. Thus, the total thickness of beds at Dundas Harbour assigned by the present authors to the Cass Fjord Formation is, according to the measurements of Kurtz et al., 355.16 m. This figure accords reasonably well with the 334.2 m thickness of Cass Fjord rocks (shown as section 3 on Figure 8) calculated for the same sequence of exposures designated by Kurtz et al. as the type section of the Ooyahgah Formation.

The correlation of the Cass Fjord Formation is discussed further under the Blanley Bay Formation section of the present report.

Lower Ordovician

Cape Clay Formation

Definition and distribution

The Cape Clay Formation was named by Poulsen (1927) after Kap Clay in Washington Land, Greenland, for a unit of limestone that lies conformably on the Cass Fjord Formation. Koch (1929b, p. 280) described the Cape Clay Formation in Washington Land as being 30 to 50 m thick and composed of "massive-bedded, cliff-forming, very hard limestone of a yellow colour, interstratified with limestone conglomerate". Probably what Koch refers to here as limestone conglomerate is, in fact, mottled limestone. Firstly, mottled carbonate rock is a widespread feature in the Cape Clay in the Canadian Arctic Archipelago, and Henricksen and Peel (1976), in their brief description of the Cape Clay in Washington Land, make no mention of limestone conglomerate, while noting that the formation is commonly finely mottled; secondly, Poulsen's (*op. cit.*, p. 245) remark that the pebbles of the conglomerate "are so intimately fused with the matrix that the whole rock has the character of compact limestone . . ." would seem to indicate mottled rock rather than conglomerate[1].

Poulsen was the first to suggest that the Cape Clay was also present in eastern Ellesmere Island. According to him, the "*Orthoceras* limestone" described in Bache Peninsula, Ellesmere Island, by Per Schei in 1904, was correlative with the Cape Clay of Washington Land on both faunal and lithological grounds. Poulsen's (*op. cit.*) suggestion was confirmed by Christie (1967), who, in his regional study of the geology of Bache Peninsula, characterized the Cape Clay as a cliff-forming dolomite that was medium to coarse grained, thick bedded to massive, porous to cavernous, and weathered to a distinctive orange-brown colour. In 1977, Christie identified the Cape Clay Formation at Sverdrup Inlet on the north coast of Devon Island and at Cuming Inlet and Croker Bay on the south coast of the Island. He noted also that the Cape Clay, as observed by him in Devon Island, consisted mainly of dolomite, and was probably correlative with the upper, thick bedded limestone in the upper part of the Mingo River Formation, as defined at Dundas Harbour by Kurtz et al. (1952).

The identity of the Cape Clay dolomite in those parts of Devon Island studied by Christie (1977), with the upper, cliff-forming part of the Mingo River Formation, is confirmed by the present study on grounds of both physical stratigraphy and paleontology. It is proposed, therefore, that use of the name Mingo River Formation be discontinued and replaced by the name Cape Clay Formation, which has priority. The upper part of the Mingo River referred to here is the rock unit 53.64 m (176.0 ft) thick that is second from the top of the type section of the formation described by Kurtz et al. (1952, p. 645).

The Cape Clay is primarily a rock unit of the Arctic Platform and is traceable from northwestern Greenland, through southeastern Ellesmere Island, and across Devon Island. It is, however, also recognized in the Panarctic Deminex Cornwallis Central Dome K-40 well in the miogeosynclinal succession of Cornwallis Island (see footnote on p. 38).

[1]It should be noted that Kerr (1968) recorded flat-pebble conglomerate in a single section of the Cape Clay Formation that he studied in Bache Peninsula, Ellesmere Island. However, Kerr's described characteristics of Cape Clay rocks in this section differ so much from the lithological characterization of the Cape Clay as given by Christie (1967) in other parts of Bache Peninsula, that ascription of these rocks to that formation may be in error.

Exposures of the Cape Clay are confined to eastern parts of the report area. Cape Clay rocks are widely distributed in the coastal regions of *Dundas Harbour*, *Powell Inlet* and *Bear Bay East*, where completely exposed sections of the formation are common. Westernmost exposures of the formation are confined to limited areas in eastern parts of both *Maxwell Bay* and *Bear Bay West*.

Lithology and thickness

Four measured sections (3, 14, 24, 26) of the Cape Clay Formation are shown on Figure 8.

As in the case of Cape Clay rocks in Ellesmere Island versus those in neighbouring parts of Greenland, two laterally equivalent lithologies characterize rocks of this formation on Devon Island. In the environs of Dundas Harbour and Croker Bay (*Dundas Harbour*), the formation consists mainly of limestone, whereas in all other parts of Devon Island it is made up entirely of dolomite.

The Cape Clay Formation on Devon Island is a uniform succession of more or less pure carbonate rocks. It is a relatively thin rock unit, with an average thickness of 65 m throughout its area of outcrop. It is only 87.5 m thick in the Panarctic Deminex Cornwallis Central Dome K-40 well of Cornwallis Island, and it would, therefore, appear that the formation does not thicken significantly when followed from east to west in the subsurface of western Devon Island. The Cape Clay overlies the Cass Fjord Formation with a sharp, conformable contact (figs. 30, 81), the surface of separation being drawn, in most places, where thin to mainly medium bedded dolomite of the uppermost member of the Cass Fjord gives place upward to mainly thick bedded and massive limestone or dolomite of the Cape Clay. In other places, a thin shaly unit (0.1-0.8 m) forms the uppermost part of the Cass Fjord. The principal weathering colour of the dolomite facies is pale brown to greyish brown, whereas that of the limestone facies is light brown to greyish yellow, and these colours contrast rather markedly with the overall weathering colours of the underlying and overlying formations. Moreover, the Cape Clay is topographically prominent and forms the rimrock along many of the fiords and stream valleys (figs. 1, 3, 30). In fact, Cape Clay and Bear Point rocks share the distinction of being the most resistant sedimentary formations on Devon Island.

Worthy of special mention is the fact that two sets of more or less vertical joints characterize the sedimentary rocks of Devon Island. It is in the Cape Clay that this jointing appears to be best developed, a circumstance that, in places, imparts the superficial resemblance of columnar basalt to the formation, particularly as viewed from a distance (Fig. 23). Koch's (1929a, figs. 2, 3) photographic illustrations of the Cape Clay in Washington Land clearly indicate that jointing is a well developed feature in the formation of that region (see also Henricksen and Peel, 1976). The statement on page 14 of Koch's report that "In the coast cliffs the limestone forms isolated rocky areas, columns and pillars, which are extremely picturesque . . ." also applies to many exposures of Cape Clay rocks on Devon Island.

Limestone facies. Fresh surface colours include various light shades of grey and brown. The limestone is commonly dolomitic, and consists of intensely burrowed lime mudstone with rare skeletal fragments (Fig. 31). The burrows consist of intraclast grainstones which, in some instances, form entire beds. The burrows are largely dolomitized and form a labyrinthine pattern of hypidiomorphic, medium crystalline

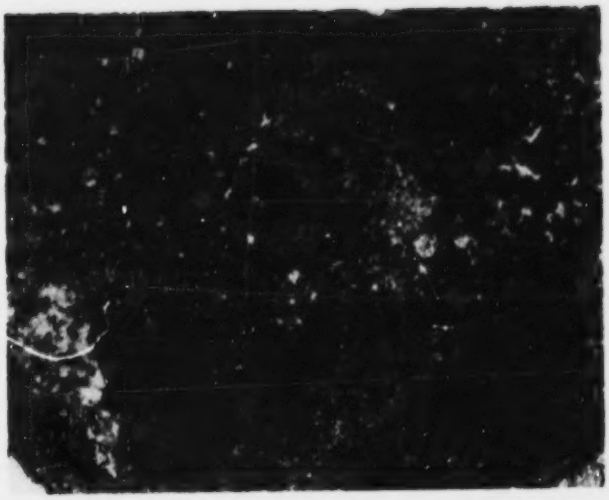

Figure 31. *Photomicrograph of limestone from the limestone facies of the Cape Clay Formation. This is an example of labyrinthine-mottled limestone that is typical of various Ordovician formations in the report area. The material in the lower right-hand corner consists of undisturbed lime mudstone with a few floating skeletal fragments. In the upper left-hand corner is grainstone, consisting of irregular micrite clasts and minor pellets. The grainstone is probably the result of bioturbation. A dolomitized burrow is visible in the centre of the slide. (C-77319, section 3, Fig. 8; composite stratigraphic section A, unit 61.)*

dolomite (Fig. 32). In addition, isolated dolomite euhedrons occur throughout the lime mudstone and grainstone. In some instances, the dolomite content is sufficient to form interbeds of calcareous dolomite within this facies. Small, irregular chert nodules occur throughout the rocks.

Dolomite facies. Fresh surface colours include various shades of grey, yellow and brown, particularly the latter. The dolomite is variably calcareous and has a medium crystalline, xenotopic to hypidiotopic fabric. A labyrinthine mottling similar to that of the limestone facies is usually evident on weathered surfaces. The original fabric is generally not preserved, although in one thin section a suggestion of grainstone texture was observed. Chert nodules similar to those in the limestone facies are particularly common in the upper part of this facies. Vuggy porosity is moderately well developed in some sections of the facies.

The outstanding characteristics of the Cape Clay are: its uniform mineral composition, whether it be dolomite or limestone; thick bedded to massive character; pale brown to greyish brown weathering colours of the dolomitic facies; and extreme hardness.

Age

Most exposures of the Cape Clay Formation that were examined during the course of the present study appear to lack organic structures. The only fossils observed included

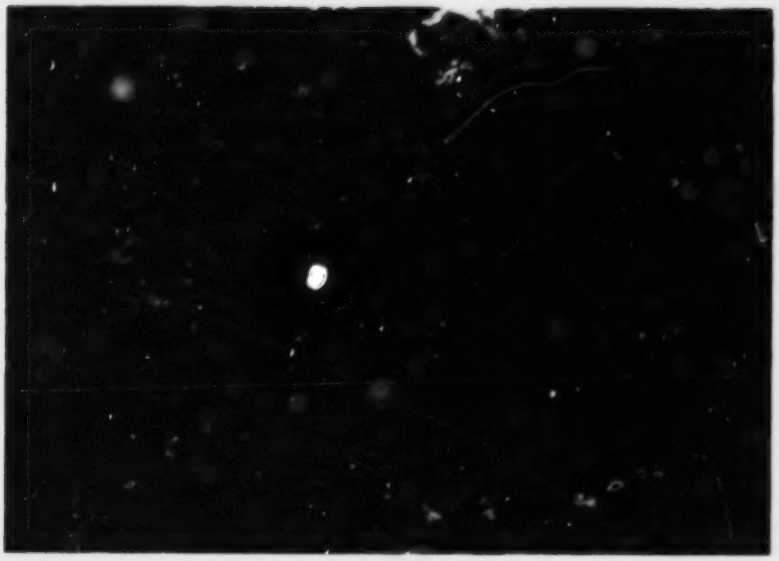

Figure 32. *Lime mudstone and wackestone rocks of the Cape Clay Formation showing labyrinthine mottling that follows bioturbation features. The rocks shown here were observed at Dundas Harbour (**Dundas Harbour**) where section 3 (Fig. 8) was studied. This lithology is also characteristic of the resistant members of the Eleanor River Formation, Thumb Mountain Formation, and lower member of the Allen Bay Formation on Devon Island.*

fragmentary brachiopods and trilobites, rare stromatolite heads, and orthocone cephalopods, commonly in apex-upward positions. It may be noted, however, that Kurtz et al. (1952) reports *Hystricurus? nudus* from rocks at Dundas Harbour that are referred herein to the Cape Clay Formation. In addition, Poulsen's (1927) taxonomic study of Cape Clay fossils from Washington Land includes a cephalopod, a stromatolite, and several brachiopods, gastropods and trilobites. In 1946, Poulsen dated the Cape Clay as early Canadian, which corresponds to the age assignment of this formation on Devon Island.

Most samples of the Cape Clay rocks that were processed for microfossils yielded conodonts, and these are listed below:

Section 3

GSC loc. C-77318; 1.7 m above base of formation

Acodus oneotensis Furnish s.f.
Acontiodus cf. *A. iowensis* Furnish s.f.
A. cf. *A. propinquus* Furnish
A. staufferi Furnish s.f.
"Drepanoistodus" n. sp.
Paltodus bassleri Furnish s.f.
P. variabilis Furnish s.f.
"Scolopodus" n. sp.

GSC loc. C-77323; 49.2 m above base of formation

Acodus oneotensis Furnish s.f.
Acontiodus iowensis Furnish s.f.
A. staufferi Furnish s.f.
Clavohamulus densus Furnish
C. cf. *C. elongatus* Miller
Drepanodus cf. *D. parallelus* Branson and Mehl s.f.
D. sp. s.f.
Paltodus bassleri Furnish s.f.

GSC loc. C-77325; top of formation

Acontiodus staufferi Furnish s.f.
Clavohamulus densus Furnish
Loxodus sp.
Paltodus bassleri Furnish s.f.

Section 2 on Figure 9

GSC loc. C-77269; 41.4-44.4 m below top of formation

Acodus oneotensis Furnish s.f.
Acontiodus cf. *A. iowensis* Furnish s.f.
Cordylodus angulatus Pander
Drepanodus lineatus (Furnish) s.f.
Oneotodus gracilis (Furnish)
Paltodus bassleri Furnish s.f.
P. variabilis Furnish s.f.
"Scolopodus" n. sp.

Section 11 on Figure 9

GSC loc. C-79417; sample collected from upper 0.6 m of formation

Acodus oneotensis Furnish s.f.
Acontiodus staufferi Furnish s.f.
Clavohamulus densus Furnish
Cordylodus angulatus Pander s.f.
C. prion Lindström s.f.
C. rotundatus Pander s.f.
Juanognathus n. sp.
Paltodus bassleri Furnish s.f.

Section 21 on Figure 9

GSC loc. 80132, sample collected at top of formation

Acodus oneotensis Furnish s.f.
Acontiodus iowensis Furnish s.f.
A. staufferi Furnish s.f.
Cordylodus prion Lindström s.f.
Drepanodus lineatus Furnish s.f.
Drepanodus n. sp.
Drepanoistodus sp.
Paltodus bassleri Furnish s.f.
P. variabilis Furnish s.f.

The identifications were by G.S. Nowlan, who stated that all of the samples were characteristic of Fauna C (Ethington and Clark, 1971) of early to mid-Canadian age (late Tremadocian to early Arenigian).

Some problems concerning the correlation of Cape Clay rocks in the archipelago are discussed in the following section.

Blanley Bay Formation

Definition

The name Blanley Bay is proposed here for a unit, composed mainly of dolomite and sandstone, that is interposed conformably between the top of the Cape Clay Formation and the base of the Eleanor River Formation. Associated with the principal rock types are minor amounts of flat-pebble conglomerate, gypsum, limestone and shale. The type section chosen for the Blanley Bay is near the head of a small, unnamed fiord on the south coast of Devon Island, about 10 km east of Blanley Bay, in *Powell Inlet*, where the formation is completely exposed (see Figure 33; and section 21, Figure 9). The rocks of the Blanley Bay are relatively soft, and in this respect they contrast markedly with those of the underlying and overlying formations (figs. 3, 33). The contact between the Blanley Bay and Cape Clay is sharp, and is drawn where dominantly thick bedded to massive, brownish weathering dolomite (or limestone in the environs of Dundas Harbour and Croker Bay), give place upward to thin and medium bedded, mainly light greyish weathering dolomite (or less commonly limestone) of the Blanley Bay. There is neither paleontological nor physical evidence to indicate that this contact is an unconformity.

The beds herein referred to the Blanley Bay Formation appear to belong to the same rock unit described by Christie (1977) under the heading of *Lower Ordovician carbonate beds.*

Distribution and thickness

The Blanley Bay Formation is distributed widely throughout the map areas of *Dundas Harbour*, *Powell Inlet* and *Bear Bay East*. Westernmost exposures of the formation occur in the eastern coastal areas of *Maxwell Bay* and *Bear Bay West*. Excellent exposures of the Blanley Bay occur in the sea cliffs, but inland the formation is commonly poorly exposed. The thickness of the formation ranges from a minimum of about 100 m in the east to a maximum of about 175 m in the west.

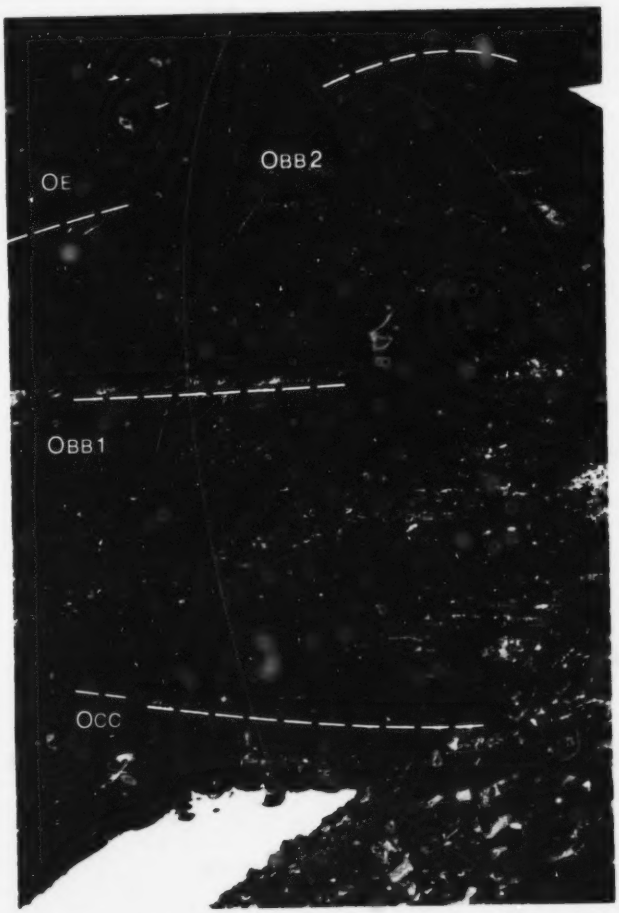

Figure 33. *Type section of the Blanley Bay Formation* (OBB1 = *lower member*; OBB2 = *upper member*) *near head of an unnamed bay about 11 km west of Blanley Bay on the south coast of Devon Island* (**Powell Inlet**). *Note recessive weathering character of Blanley Bay rocks that contrasts markedly with the cliff-forming rocks of the underlying Cape Clay Formation* (OCC) *and overlying Eleanor River Formation* (OE). *Note man standing in middle ground. Photograph by T.A. Garagan.*

Lithology

Six measured sections (2, 8, 11, 21, 26, 27) of the Blanley Bay are shown graphically on Figure 9.

The formation is divisible into two distinctive lithological units: a lower resistant member consisting mainly of planar-bedded dolomite that forms receding ledges above the cliff-forming Cape Clay; and an upper recessive weathering member that is composed mainly of dolomite and sandstone (Fig. 33). Throughout the distributive area of the formation the upper member is generally about twice as thick as the lower member. The overall weathering colours of the formation, particularly as viewed from a distance, are light grey to medium light grey and greenish grey, with some cliff sections exhibiting greyish orange and very pale orange colours in the upper part of the formation.

The dolomite of the lower member occurs ordinarily in thin or medium beds with internal laminae. Thick beds occur mainly toward the top of the member. The predominant fresh surface colour ranges from medium light grey to dark grey, but various shades of brown also are rather common. The dolomite varies from finely to medium crystalline, with finely crystalline rocks more common in western than in eastern parts of the distributive area. Original texture is rarely preserved. The fabric is hypidiotopic, some almost xenotopic, and some beds appear to have been derived from pelletal or intraclast grainstone. The dolomite is variably, but generally sparsely silty or sandy. Fine-grained, calcareous sandstone is thinly scattered in the type section and forms a conspicuous unit about 7.5 m thick in section 2 at Dundas Harbour. Moreover, some dolomite beds at Dundas Harbour appear to be of detrital origin. Dark grey, thin bedded limestone constitutes a significant lithology at the base of sections 8 and 11 on either side of Croker Bay. Beds of flat-pebble conglomerate are sparsely represented throughout the member. This rock consists of pebbles of silty and sandy, medium crystalline dolomite in a matrix of medium crystalline hypidiotopic dolomite. The boundaries of the pebbles are marked by microstylolites and other solution features. Beds of argillaceous dolomite are rare, but in section 8, east of Croker Bay, X-ray analysis of a sample indicates the presence of nine per cent montmorillonite and one per cent illite. Bioturbation and stromatolites are rare in this member.

The following description of the upper member is based mainly on the type section on the south coast and section 27 on the north coast. The member consists principally of alternating units of dolomite and sandstone. The dolomite is commonly various shades of brown and grey, thin to medium bedded, and medium crystalline. Sandy and silty impurities consisting mainly of quartz are common, but in some specimens microcline is present in quantities up to two per cent. Where original fabric is preserved, grainstone can be recognized (Fig. 34). Flat-pebble conglomerates occur as rare interbeds in the dolomite. The sandstone is a mature, medium to coarse grained quartzarenite. It is commonly various shades of yellow in colour, thin bedded and poorly consolidated. It also contains rare desiccation cracks and interbeds of sandy oolite and sandy dolomite (figs. 35, 36). High-angle crossbeds are common. Some dolomite beds in section 26 consist of sandy xenotopic dolomite with carbonate intraclasts. In the type section and at section 2 are several beds of evaporitic breccia, with minor amounts of papery weathering shale that also contains gypsum, and montmorillonite (up to 49 per cent). Furthermore, some of the dolomite in these sections is gypsiferous. Although none of the measured sections contain bedded gypsum, it is noteworthy that a unit of thin bedded gypsum, about 10 m thick, was observed near the middle of the upper member on the west side of an unnamed bay, some 24 km southeast of Skruis Point at Station 58, Bear Bay West.

Age

About half the samples processed for microfossils yielded conodonts, and these indicate an Early Ordovician age for the formation. The conodonts have been studied by G.S. Nowlan, whose identification and age determinations are given below:

Section 2

GSC loc. C-77270; lower member; 8.0-8.4 m above base

Clavohamulus cf. *C. elongatus* Miller
Paltodus bassleri Furnish s.f.

Remarks: *P. bassleri* is characteristic of Fauna C (Ethington and Clark, 1971). Typical *C. elongatus* is known only from Fauna A (Miller, 1969, 1978). The sample is of early Canadian age.

GSC loc. 77266; upper member?; 54.9-57.2 m above base of formation

Drepanodus cf. *D. parallelus* Branson and Mehl s.f.
Paltodus cf. *P. bassleri* Furnish s.f.

Remarks: Based on the scanty recovery, the sample is probably of Lower Ordovician age, possibly Fauna C (Ethington and Clark, 1971).

Section 8

GSC loc. 77143; lower member; 6.6 m above base

Acodus oneotensis Furnish s.f.
Acontiodus cf. *iowensis* Furnish s.f.
A. propinquus Furnish s.f.
A. staufferi Furnish s.f.
Cordylodus proavus Müller s.f.
Juanognathus n. sp.
Loxodus bransoni Furnish
Paltodus bassleri Furnish s.f.
New Genus n. sp.

Remarks: Apart from *C. proavus*, which is represented by a single specimen, the fauna is characteristic of Fauna C (Ethington and Clark, 1971), of early to middle Canadian age (late Tremadocian to early Arenigian). The elements referable to *Juanognathus* are the same as those recovered from the Baumann Fiord Formation (Nowlan, 1976). *C. proavus* is previously known only from Fauna A and is probably a contaminant in this sample.

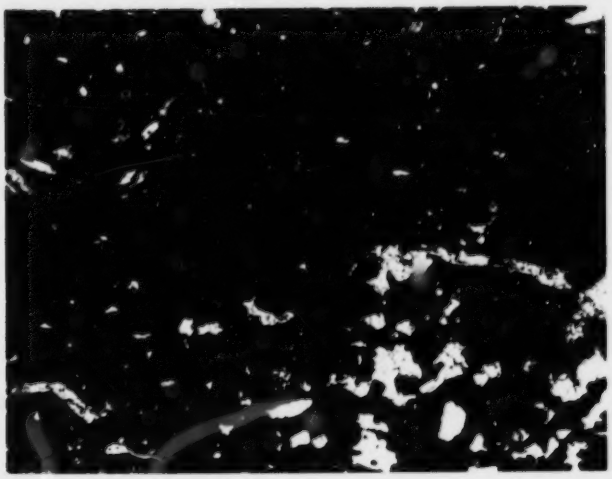

Figure 34. *Photomicrograph of dolomite from the upper member of the Blanley Bay Formation. The original grainstone is recrystallized to very finely and finely crystalline dolomite. Recognizable clasts are composite grains, skeletal fragments, and possibly ooids. Secondary, intragranular, leached porosity is present. (C-85252-A, section 21, Fig. 9; composite stratigraphic section F, units 29-28; grab sample.)*

GSC loc. 77146; lower member; 25.7 m above base

Acontidodus iowensis Furnish
A. propinquus Furnish
Juanognathus n. sp.
Loxodus bransoni Furnish
Paltodus bassleri Furnish s.f.
Paltodus sp.

Remarks: All of these taxa, with the exception of *Juanognathus* n. sp. are characteristic of Fauna C (Ethington and Clark, 1971) of early to middle Canadian age (late Tremadocian to early Arenigian). The forms referred to *Juanognathus* are conspecific with new taxa described under the genus by Nowlan (1976) from the Baumann Fiord Formation. This fauna is essentially the same as that from sample C-77143.

Section 11

GSC loc. 79419; lower member; 12.5 m above base

Acodus oneotensis Furnish s.f.
Acontiodus staufferi Furnish s.f.
Paltodus bassleri Furnish s.f.
Gen. et sp. indet.

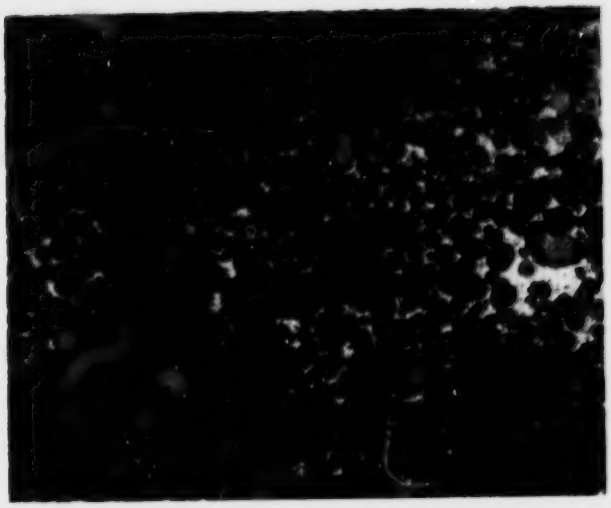

Figure 35. *Photomicrograph of oolite from the upper member of the Blanley Bay Formation. The ooids in this rock are recrystallized, and consist of finely crystalline calcite or chert. Finely crystalline quartz forms the cement. (C-77260, section 2, Fig. 9; fragment from solution breccia.)*

Remarks: The fauna is characteristic of Fauna C (Ethington and Clark, 1971), which ranges in age from the late Tremadocian to early Arenigian (early to middle Canadian). Nowlan (1985) places this assemblage in the Cape Clay Formation.

Section 21

GSC loc. C-80134; lower member; 26.1 m above base

Acodus sp.
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Branson and Mehl s.f.
Drepanoistodus sp.
Scolopodus quadraplicatus Branson and Mehl s.f.
S. triplicatus Ethington and Clark s.f.
Ulrichodina abnormalis Branson and Mehl

Remarks: This fauna is characteristic of Fauna D of Ethington and Clark (1971) of middle to late Canadian age. Elsewhere in the Arctic Islands, it is typical of member 1 of the Eleanor River Formation and is locally present at the top of the Baumann Fiord Formation (Barnes, 1974; Nowlan, 1976).

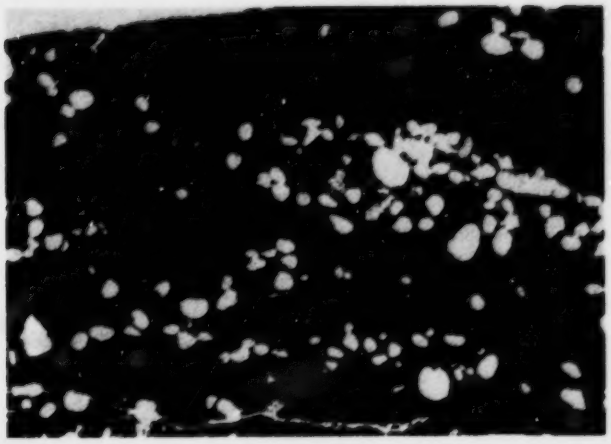

Figure 36. *Photomicrograph of dolomite from the upper member of the Blanley Bay Formation. The dolomite is aphanocrystalline. The lamination is irregular and suggestive of an algal origin. Between the laminae are mature, coarse grained quartz sand and rare carbonate and siltstone clasts. (C-85252-C, section 21, Fig. 9; composite stratigraphic section F, units 24-28; grab sample.)*

Section 27

GSC loc. C-77073; upper member; 19.9-39.9 m below top

?Acodus deltatus Lindström
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oistodus aff. *O. inaequalis* Lindström s.f.
O. sp. s.f.
Scolopodus cornutiformis Branson and Mehl
"S. cornutiformis" Branson and Mehl s.l.
S. emarginatus Barnes and Tuke
S. quadraplicatus Branson and Mehl s.f.
S. robustus Ethington and Clark s.f.
S. triplicatus Ethington and Clark s.f.
S. n. sp. 1
Ulrichodina n. sp. A
Walliserodus australis Serpagli
New Genus 1 n. sp.
New Genus 2 n. sp.

Remarks: This group of drepanodan and scolopodan elements is typical of Fauna D (Ethington and Clark, 1971) and is of middle Canadian (middle Arenigian) age. The new species of *Scolopodus* and *Ulrichodina* and both New Genus 1 and New Genus 2 have been recognized in the Eleanor River Formation elsewhere in the Arctic Islands (Nowlan, 1976). Overall, the fauna is typical of member 1 of the Eleanor River Formation in western Devon and Ellesmere islands (Nowlan, 1976).

To sum up, conodont collections from the Blanley Bay are characteristic of Faunas C to D of Ethington and Clark (1971), and the formation appears to range from about early to late Canadian (late Tremadocian to middle Arenigian) in age.

The Blanley Bay is mostly devoid of megafossils. Two small collections from near the base of the formation in section 11 have been identified by B.S. Norford, and are listed below:

GSC loc. 79418; 3 m above base of formation

indeterminate asaphid trilobite
Symphysurina sp.
Age: Early Tremadocian Zone A or B of trilobite zones.

GSC loc. 79419; 12.5 m above base of formation

Ophileta (s.l.) sp.
orthid brachiopod
trilobite debris
Age: Tremadocian or Arenigian (see associated conodonts as identified by G.S. Nowlan above).

Correlation

Stratigraphic and paleontological evidence support the judgment that the Blanley Bay is in part, at least, correlative with the Baumann Fiord Formation, a largely evaporitic unit that is distributed widely in the Franklinian Miogeosyncline (Kerr, 1967a, 1968; Thorsteinsson and Kerr, 1968; Nowlan, 1976; Mayr, 1978; Mossop, 1979), and which occurs also in a limited part of the Arctic Platform in Bache Peninsula on the central portion of the east coast of Ellesmere Island (Christie, 1967). Throughout its entire areal extent, the Baumann Fiord underlies the Eleanor River Formation, and throughout the miogeosyncline, it overlies the Copes Bay Formation, except on Cornwallis Island, where it overlies an unnamed formation[1]. As typically developed, the Baumann Fiord consists mainly of anhydrite (or its alteration product, gypsum), and lesser amounts of limestone and dolomite, but in western parts of Grinnell Peninsula, rocks that Nowlan (*op. cit.*) has referred to the Baumann Fiord are made up principally of limestone, with subordinate amounts of dolomite and sandstone. Conodonts collected by Nowlan in these rocks are assigned by him to Faunas C and D, and thus indicate correlation with the Blanley Bay Formation. In light of the present study, it would now seem that the rocks Nowlan assigned to the Baumann Fiord Formation in Grinnell Peninsula might be more appropriately referred to the Blanley Bay.

[1]Mayr (1978) includes a stratigraphic study of a well, known as Panarctic Deminex Cornwallis Central Dome K-40, drilled near the geographic centre of Cornwallis Island, in which the formations were identified in order downward as: Baumann Fiord, Copes Bay and Parrish Glacier. On the basis of information arising out of the present study, the well has been restudied, and a revised formational subdivision of the well log is presented herein (see Figure 37). The formations in descending order are as follows: Baumann Fiord, 0 to 509.3 m; unnamed limestone formation, 509.3-800.1 m; Cape Clay, 800.1-887.6 m; and Cass Fiord, 887.6-3063.8 m. It is of interest to note that the rocks identified herein as the Cape Clay Formation yielded conodonts indicative of Faunas B or C of Ethington and Clark (1971). [Footnote by U. Mayr]

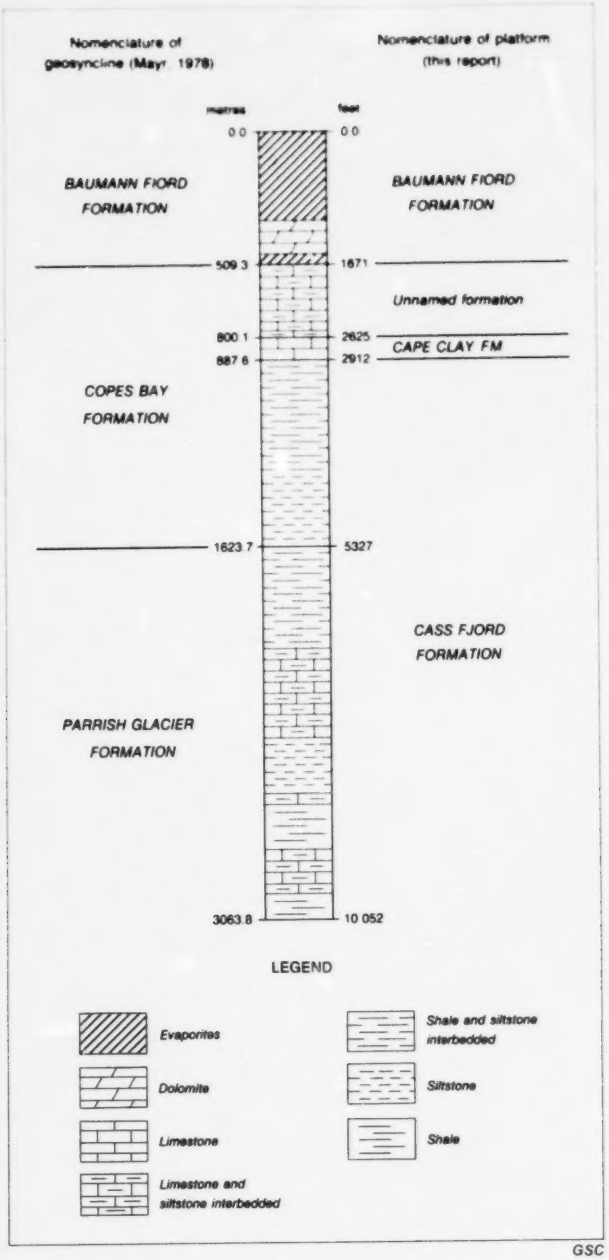

Figure 37. *Stratigraphy of the Panarctic Deminex Cornwallis Central Dome K-40 well.*

A twofold subdivision characterizes the rocks interposed between the Cape Clay and Eleanor River formations in Bache Peninsula (Christie, 1967; see also Kerr, 1968). Immediately underlying the Eleanor River is a dominantly anhydrite sequence, about 230 m thick, that is justifiably assigned to the Baumann Fiord Formation. Between the top of the Cape Clay and the base of the Baumann Fiord is an unnamed formation, about 100 m thick, that Christie (*op. cit.*) has referred to as map unit 6. The latter, as described, consists mainly of thin to medium bedded limestone and dolomitic limestone with intraformational conglomerate and lesser amounts of sandstone. Map unit 6 has not yielded diagnostic fossils, but the Baumann Fiord has yielded *Hystricurus*, of interest only insofar as its age range is early Arenigian, and therefore compatible with Nowlan's (1976) age assignment of conodonts from the beds he ascribed to that formation in Grinnell Peninsula. There is thus clearly strong evidence, based mainly on physical stratigraphy, that map unit 6 and the Baumann Fiord Formation in Bache Peninsula are correlative with the lower and upper members respectively of the Blanley Bay on Devon Island. Moreover, and for the same reason, similar facies relationships appear to hold true for the above-mentioned rock units, the unnamed limestone formation, and the overlying Baumann Fiord rocks in the Panarctic Deminex well on Cornwallis Island (see Table 2, and footnote on p. 38).

A preliminary account of stratigraphic studies conducted by Henriksen and Peel (1976) in Washington Land in northwestern Greenland has revealed the presence of a previously undescribed formation that may correlate with map unit 6 in Bache Peninsula and the lower member of the Blanley Bay Formation. This new formation overlies the Cape Clay Formation, and is referred to tentatively as the Christian Elv Formation. Henriksen and Peel's (*op. cit.*, p. 21) brief description of the Christian Elv, which is about 140 m thick, is as follows:

"The sequence is dominated by fine banded grey weathering limestones with occasional beds of intraformational conglomerate. Silty beds and laminae occur and some limestone beds are sandy and even conglomeratic. In the middle part limestones are interbanded with dolomitic beds while in the upper part a c. 25 m thick well bedded, crossbedded, sandstone occurs. The top c. 10 m of the formation is formed by a whitish fine banded dolomite.

"Poorly preserved *Ophileta* were collected at several horizons. A rich fauna from near the middle of the formation includes *Hystricurus*, *Ophileta s.s.*, *Sinuopea* and *Cyrtonellopsis* of early Ordovician age".

Christian Elv beds are overlain by the Poulsen Cliff Formation – defined originally by Troelsen (1950). The Poulsen Cliff is poorly known, and Troelsen (*op. cit.*) appears to have observed only the upper 40 m of the formation, which he described as consisting of shale and subordinate amounts of limestone conglomerate. The Poulsen Cliff overlies the Christian Elv Formation in the report area of Henriksen and Peel (*op. cit.*). According to these authors, the Poulsen Cliff is about 100 m thick, includes shale, limestone, anhydrite, intraformational conglomerate and chert, and probably is Early Ordovician in age. Of particular interest to the present discussion is the fact that Henriksen and Peel place the dividing line between the Christian Elv and Poulsen Cliff formations at the base of a conspicuous 10 m thick unit of anhydrite. The above-described characteristics of the Poulsen Cliff, and the fact that it is overlain by the Nygaard Bay Formation, which may be correlated with basal beds of the Eleanor River Formation, suggest that the Poulsen Cliff probably equates with the Baumann Fiord Formation, as developed in Bache Peninsula, and with the upper member of the Blanley Bay Formation on Devon Island.

The Blanley Bay Formation shown in section 2 on Figure 9 was measured in the same series of exposures that Kurtz et al. (1952) subdivided into the Mingo River and overlying Nadlo Point formations, and designated as the type sections of those formations (see figures 16, 38). Although the Blanley Bay in section 2 is about seven-tenths covered, it can be related with reasonable certainty to the detailed

description of the strata at this locality by Kurtz et al. (1952), which was considered by them to correspond roughly to a largely covered interval in the lower part of the Nadlo Point. More precisely, the correspondence of the strata in question here is as follows: Kurtz et al. drew the contact between the Mingo River and Nadlo Point at the base of a unit of sandstone which they measured as about 14.3 m, and they considered the contact to represent an unconformity. This sandstone constitutes a readily identifiable rock unit in the environs of Dundas Harbour and Croker Bay. According to the present study, it is about 7.5 m thick and its base does not appear to represent an unconformity. Furthermore, the base of the sandstone does not correspond to the basal contact of Blanley Bay, which is placed about 8 m lower stratigraphically, in keeping with the characteristics of the Blanley Bay-Cape Clay contact described earlier. Accordingly, the base of the Blanley Bay lies within the upper part of beds referred to as the Mingo River Formation by Kurtz et al. Stratigraphically above this unit of sandstone, Kurtz et al. have described 42.9 m of limestone, overlain by a covered interval of 45.7 m, all within the lower part of the Nadlo Point Formation. According to the present study, about 6 m of dolomite beds overlie the sandstone unit, and these beds are, in turn, overlain by a largely covered interval about 85 m thick. This last interval appears to represent most, and probably all, of the remaining upper part of the Blanley Bay at this locality. The beds that overlie this significant, covered interval form the upper part of the Nadlo Point as defined by Kurtz et al. However, they are judged to comprise a nearly completely exposed section of the Eleanor River Formation in the present account.

The stratigraphic relationships of the Parrish Glacier and Copes Bay formations in the Franklinian Miogeosyncline of Ellesmere Island to the Cass Fjord and Cape Clay formations, and map unit 6 in the Arctic Platform of Bache Peninsula, cannot be determined on the basis of present knowledge. However, correlations of these various formations are attempted in Table 2, and it is, therefore, appropriate at this juncture to deal briefly with the stratigraphic problems.

The Parrish Glacier Formation overlies the Scoresby Bay Formation with a sharp and possibly disconformable contact. It consists chiefly of limestone that is mainly thin bedded and variably argillaceous and silty. Minor constituents include shale, siltstone and flat-pebble conglomerate (Thorsteinsson, 1963a; Kerr, 1968). The formation has yielded a single new genus of a bathyuriscid trilobite of which the middle Cambrian genus *Clavaspidella* is probably the closest known relative. The trilobite was collected near the base of the formation. The Copes Bay Formation overlies the Parrish Glacier and underlies the Baumann Fiord Formation. It is made up mainly of thin bedded limestone that is variably argillaceous, with lesser amounts of anhydrite and flat-pebble conglomerate (Kerr, 1968). The formation has not yielded diagnostic fossils on Ellesmere Island. Kerr (*op. cit.*) has correlated the Copes Bay Formation with the Cass Fjord and Cape Clay formations, and map unit 6 in the Arctic Platform succession of Bache Peninsula. Following Thorsteinsson (1963a), he considered the Copes Bay Formation to be separated from the Parrish Glacier by an unconformity. However, in view of the fact that:

1. The Cass Fjord in the Canadian Arctic appears to range from Middle Cambrian to Early Ordovician in age, as established in Greenland by Henriksen and Peel (1976), and;

2. Because of the striking similarity in lithologies between the Parrish Glacier, Copes Bay and Cass Fjord formations, it appears now that the Parrish Glacier and Copes Bay are probably correlative with the Cass Fjord and, furthermore, that the Parrish Glacier and Copes Bay are not separated by an unconformity.

In fact, a question arises as to whether a mappable contact exists between Parrish Glacier and Copes Bay rocks, and whether the Parrish Glacier and Copes Bay might not be unnecessary names for rocks that might be more appropriately referred to the Cass Fjord Formation. The names should, however, be retained *pro tempore* pending resolution of these problems and the problem of correlating the Cape Clay Formation and Christie's map unit 6 with rocks in the miogeosyncline. The central problem here is that the Cape Clay is apparently not represented as a distinctive lithologic unit in the miogeosyncline of Ellesmere Island. Two alternative relationships seem most readily apparent:

1. Map unit 6 and Baumann Fjord in Bache Peninsula are correlative respectively with the lower and upper parts of the Baumann Fiord in the miogeosyncline, and the Cape Clay is correlative with the uppermost beds in the Copes Bay Formation;

2. The Baumann Fiord strata in the Arctic Platform and miogeosyncline correlate one for one, in which case the underlying map unit 6 is correlative with the uppermost strata of the Copes Bay, and the Cape Clay can be correlated with stratigraphically lower beds in the Copes Bay.

Kerr (1968) has opted for the latter alternative, which also is tentatively adopted here (see Table 2). It should be stressed, however, that stratigraphic relationships other than those outlined above might well characterize the formations in question here.

Lower and Middle Ordovician

Eleanor River Formation

Definition

The Eleanor River Formation was established by Thorsteinsson (1958). It consists of a unit of limestone on Cornwallis Island that is overlain conformably by the Cornwallis Formation, and comprises the oldest rocks that he observed on the island. At the time of publication, Thorsteinsson (*op. cit.*) had not observed the base of the Eleanor River. The formation was redefined by Kerr (1967a; see also Kerr, 1968), on the basis of field studies on Ellesmere Island, to consist mainly of a resistant sequence of limestone that was situated stratigraphically above the Baumann Fiord Formation and below the Bay Fiord Formation. Because of the poorly exposed nature of the type section of the Eleanor River on Cornwallis Island, Kerr (1967a) named as a reference section for the formation a well exposed section, 705 m thick in central Ellesmere Island. Moreover, he noted that the Eleanor River overlies the Baumann Fiord Formation on Cornwallis Island.

Throughout most of its areal extent, the Eleanor River overlies evaporitic rocks of the Baumann Fiord Formation but, in Devon Island, it overlies the Blanley Bay Formation. In most places, the Eleanor River and Blanley Bay formations

are separated by a sharp conformable contact and, furthermore, there is good faunal evidence that this contact does not represent any significant break in sedimentation. However, it should be noted that at one locality on the north coast of Devon Island this contact appears to be represented by a surface of erosion (Fig. 39).

Distribution

The Eleanor River Formation is widely distributed throughout *Dundas Harbour*, *Powell Inlet* and *Bear Bay East*, and in limited areas along the eastern borders of *Maxwell Bay* and *Bear Bay West*. The most extensive single outcrop area of the formation is a belt of exposures that traces a northerly path across Devon Island, on the east side of the narrow "waist" of the island. This "waist" is marked by the deep and opposing indentations formed by Maxwell Bay on the south coast and Thomas Lee Inlet on the north coast. The best exposed sections of the formation occur in the sea cliffs where this belt of exposures meets Lancaster and Jones sounds. As a point of interest, it is this belt of exposure that marks the beginning of the westerly-dipping Devon homocline. Exposures of the Eleanor River also occur in central parts of the Haughton crater (*Bear Bay West*).

Lithology and thickness

The Eleanor River Formation in the report area consists mainly of limestone and lesser amounts of dolomite. It is divisible into four well defined rock units of regional extent (figs. 38, 40, 41, 45, 47). They are considered as informal members and designated A to D, in ascending order. Member A consists mainly of resistant medium bedded to massive strata. Member B is made up principally of very thin to thin bedded strata, and is recessive. Member C comprises resistant medium to thick bedded strata. Member D consists mainly of thin bedded rocks. It includes minor amounts of anhydrite, and is rather recessive. The overall weathering colours of the various members are distinctive, particularly as viewed from a distance and in good lighting. Members A and C are shades of brown and darkish greys. Member B tends to weather light grey to medium light grey and greyish orange, especially on sloping surfaces. Member D weathers to shades of brown with lesser amounts of light grey to medium grey.

Five measured sections (2, 7, 19, 28, 29) of the Eleanor River Formation are shown on Figure 9.

The formation varies in thickness from about 150 m in the east to about 260 m in the west. The westerly increase in thickness occurs mainly within members B and D, with the former thickening from about 40 m in the east (section 7) to 114 m in the west (section 28), whereas the latter thickens from about 12 m (section 6) in the east to about 60 m (section 29) in the west. Members A and C maintain relatively uniform thicknesses of about 50 m throughout the report area.

Member A is made up mostly of lime mudstone with scattered skeletal fragments, and it is commonly mottled with dolomite in which the mottles appear to follow a labyrinthine pattern. In some beds, the clast content is sufficient to form skeletal intraclast or pelletal grainstone, or packstone. The principal fresh surface colours are pale, dark yellowish and moderate brown, but beds of medium grey to dark grey are also rather common. The member is mainly medium bedded to massive, and this is particularly true of

Figure 38. *Gently dipping outcrops of the Cape Clay* (OCC), *Blanley Bay* (OBB; *largely covered) and Eleanor River* (OE) *formations on Mingo River near the head of Dundas Harbour on the south coast of Devon Island (**Dundas Harbour**). View is to the northwest, approximately at right angles to the strike. View is also along the line of traverse where section 2 (Fig. 9) was measured, and it was along this same line of traverse that Kurtz et al. (1952) established the type sections of the Mingo River and Nadlo Point formations. Note the three resistant rock ledges in the Eleanor River Formation, each of which is marked by an X. The uppermost of these ledges marks the top of the Eleanor River. The snowdrift on the horizon appears to cap the uppermost ledge of the Eleanor River, but this is an illusion. The snowdrift marks the rimrock of a prominent mesa, about 1 km beyond the topmost ledge in the Eleanor River. The rimrock is formed by the Thumb Mountain Formation (cf. Fig. 16).*

western sections (Fig. 41), whereas eastern sections contain minor amounts of intercalated thin bedded limestone, shale and intraformational conglomerate. Chert nodules are sparingly represented in some sections.

The description of member B given here is based largely on section 28. The member is mainly laminated limestone in which the fresh surface colours are mostly light grey and medium light grey. The limestone is variably dolomitic, with the dolomite occurring as finely crystalline laminae. In

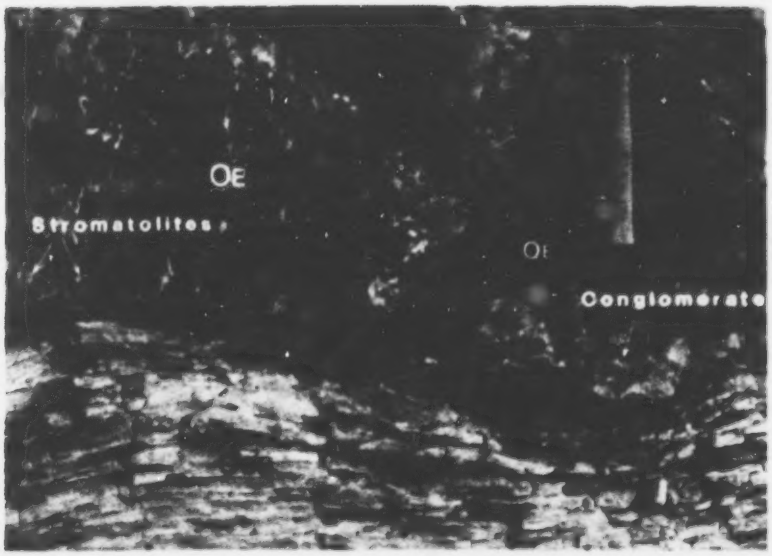

Figure 39. *Contact between the Blanley Bay (OBB) and Eleanor River (OE) formations on the north coast of Devon Island (**Bear Bay East**) where section 27 (Fig. 9) was studied. Here the contact is represented by a local disconformity, with gypsiferous shale of the Blanley Bay truncated by mottled limestone of the Eleanor River. The basal sediment in the Eleanor River Formation consists of conglomerate (containing gypsiferous shale clasts) in depressions, and small (5-7 cm), hemispherical stromatolites in the "high" areas.*

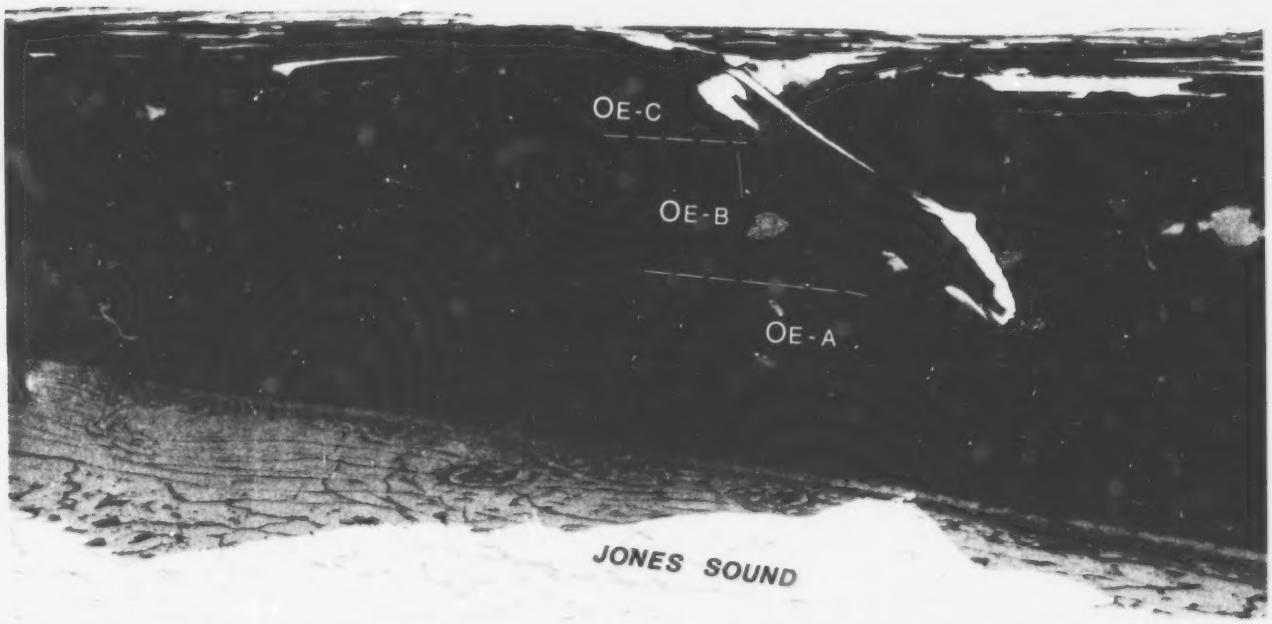

Figure 40. *A nearly complete section of the Eleanor River Formation (OE), in sea cliffs rising to an elevation of about 215 m, on the north coast of Devon Island about 12 km southeast of Skruis Point (**Bear Bay West**). View is to the south. A, B and C designate members of the formation.*

Figure 41. *A nearly completely exposed section of member A of the Eleanor River Formation* (OE-A), *about 11 km west of Blanley Bay on the south coast of Devon Island* (**Powell Inlet**). *Exposures across the bay include the Cass Fjord* (OCF), *Cape Clay* (OCC), *Blanley Bay* (OBB) *and Eleanor River formations.*

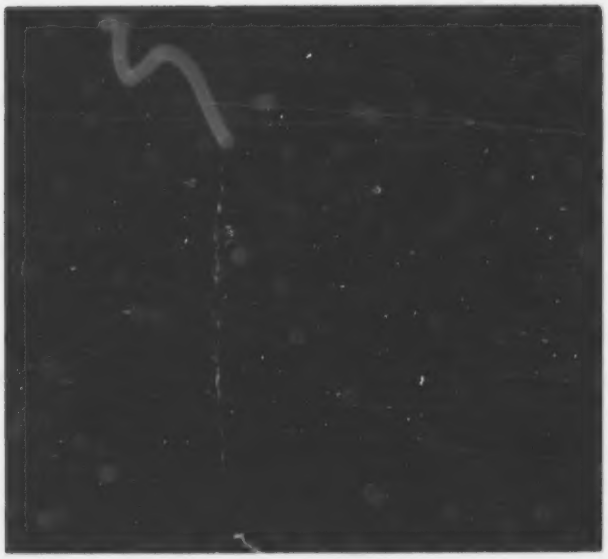

Figure 42. *Photomicrograph of limestone from member A of the Eleanor River Formation. The thin section exhibits upward fining, planar laminae of calcilutite. Floating, silt-sized grains of quartz and mica are present in the coarser parts. Crosslamination is discernible in the lower part. (C-77226, section 28, Fig. 9; composite stratigraphic section B, unit 116.)*

places, this rock grades into calcareous dolomite. The laminae are of two principal types. One is detrital calcilutite and, therefore, of sedimentary origin. In this type the laminae are mainly regular and straight with crosslamination sets (Fig. 42). Graded laminae of this type ranging from pelletal grainstone to fine calcilutite also are present. Moreover, in several samples, the laminae are accentuated by silt grains or by argillaceous material associated with the carbonate particles. The second type of laminae is of algal origin (Fig. 43). Laminae are wavy in character and commonly incorporate fenestral vugs filled with calcite. Other sedimentary structures associated with the laminated rocks include desiccation cracks that occur mainly in the lower part of the member, and rare beds of flat-pebble conglomerate that occur throughout the member. Also present are rare stromatolites that occur either as laterally linked or discrete forms.

A notable feature in the lower part of western sections of member B is a unit of resistant, medium bedded, mottled limestone about 4 m thick that is lithologically similar to rocks of member A.

Figure 43. *Photomicrograph of laminite from member B of the Eleanor River Formation. Wavy lamination, slight clotted appearance and aligned vugs suggest an algal origin for this finely crystalline dolomite. The vugs are filled with calcite and gypsum. (C-77222, section 28, Fig. 9; composite stratigraphic section B, unit 150.)*

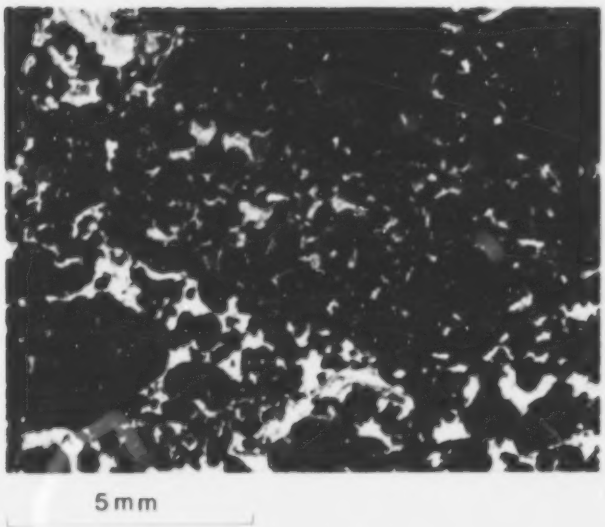

Figure 44. Photomicrograph of limestone from member C of the Eleanor River Formation. This is a grainstone composed mainly of composite grains and lesser amounts of skeletal fragments. Cement consists of sparry, finely to medium crystalline calcite. (C-77228, section 28, Fig. 9; composite stratigraphic section B, unit 172.)

Eastern occurrences of member B in the environs of Dundas Harbour and Croker Bay (sections 2 and 7, respectively) are considerably thinner than western sections, but the dominant lithology there is also laminated lime mudstone. Some differences in the lithology of sections 2 and 7 from those to the west are, however, worthy of special mention. The mudstone is interbedded with relatively greater amounts of stromatolitic boundstone. The stromatolites occur as discrete and laterally linked structures up to 50 cm thick. Dolomite laminae and rare silt grains are incorporated in the laminated rocks, while gypsum is associated with the stromatolites. The laminated stromatolitic lithology is sparsely interbedded with medium bedded, dolomitic, mottled lime mudstone, and oolitic and skeletal grainstone. The dolomitic mottles consist of medium crystalline, hypidiotopic dolomite with some zoned euhedrons. Also locally present is limestone breccia of fragmented stromatolites, interpreted herein as evaporitic solution breccia.

The lower and upper boundaries of member B are gradational, with as much as 3 m or more of beds being in doubt. The lower and upper boundaries that are shown in Figure 40 have been drawn respectively at the stratigraphically lowest and highest beds of laminated limestone. Hardgrounds are present in the boundary zones, but apparently they do not mark significant interruptions in sedimentation.

Member C of the formation is lithologically similar in most respects to member A. It is also a uniform lime mudstone succession with labyrinthine dolomite mottling. Clasts of skeletal fragments and pelletoids are common, and the member contains rare interbeds of skeletal wackestone and intraclast grainstone (Fig. 44). Light and dark coloured chert nodules occur throughout, and rare nodules of weathered gypsum with celestite rosettes were observed in section 28.

Member D consists mainly of dolomite with subordinate amounts of limestone and anhydrite. Excellent exposures of the member occur on the east side of Thomas Lee Inlet in *Bear Bay West* (section 29), around the head of Maxwell Bay (*Maxwell Bay*), and at Burnett Inlet in *Powell Inlet* (section 19).

The dolomite is dominantly thin bedded, laminated, finely crystalline and idiotopic. The principal fresh surface colours are various shades of brown, with lesser amounts of light to medium grey rocks. Sedimentary structures other than bedding are rare; they include burrows, patterned carbonate (Dixon, 1976) and small troughs. Terrigenous materials are virtually absent. The limestone is laminated and consists mainly of lime mudstone, but pelletal intraclasts, grainstone, and stromatolitic boundstone are also present. The laminae appear to consist mainly of floating zones of dolomite euhedrons (Fig. 46), with some dolomite apparently replaced by calcite. The anhydrite, which occurs only in westernmost exposures of the member, is very thin bedded and commonly laminated with thin interbeds of dolomite. It occurs as relatively thin, discrete rock units that vary from about 0.5 to 2 m thick. Three such units were observed in a completely exposed section that was examined cursorily at the head of Maxwell Bay.

Age

Megafossils are sparsely distributed in all four members of the Eleanor River. They include solitary corals, gastropods, cephalopods, brachiopods and trilobites, but none were sufficiently well preserved to permit even generic assignment. However, the Eleanor River has yielded several collections of conodonts, indicating that the formation ranges from about Fauna D of Ethington and Clark (1971) to Faunas 1 or 2 of Sweet et al. (1971). The age of the formation is, therefore, about middle Canadian to early Whiterockian (late Arenigian). The conodonts are listed below. Identifications and age assignments were made by G.S. Nowlan.

Section 2

GSC loc. C-77267; member A; 0.0-3.0 m above base

Diaphorodus delicatus Branson and Mehl
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
D. sp. s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oepikodus intermedius Serpagli
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. quadraplicatus Branson and Mehl s.f.
S. robustus Ethington and Clark s.f.
S. triplicatus Ethington and Clark s.f.
Ulrichodina abnormalis (Branson and Mehl)
Walliserodus australis Serpagli

Remarks: The scolopodan and drepanodan elements of this fauna are representative of Fauna D (Ethington and Clark, 1971). *"A". delicatus* is known from the Jefferson City Formation, s.l. associated with elements of Fauna D (Branson and Mehl, 1933). *O. intermedius* has been reported from Arenigian strata of Argentina (Serpagli, 1974) as a predecessor of *O. communis* (Ethington and Clark) which characterizes Fauna E of the midcontinent. The sample is of middle Canadian (Arenigian) age.

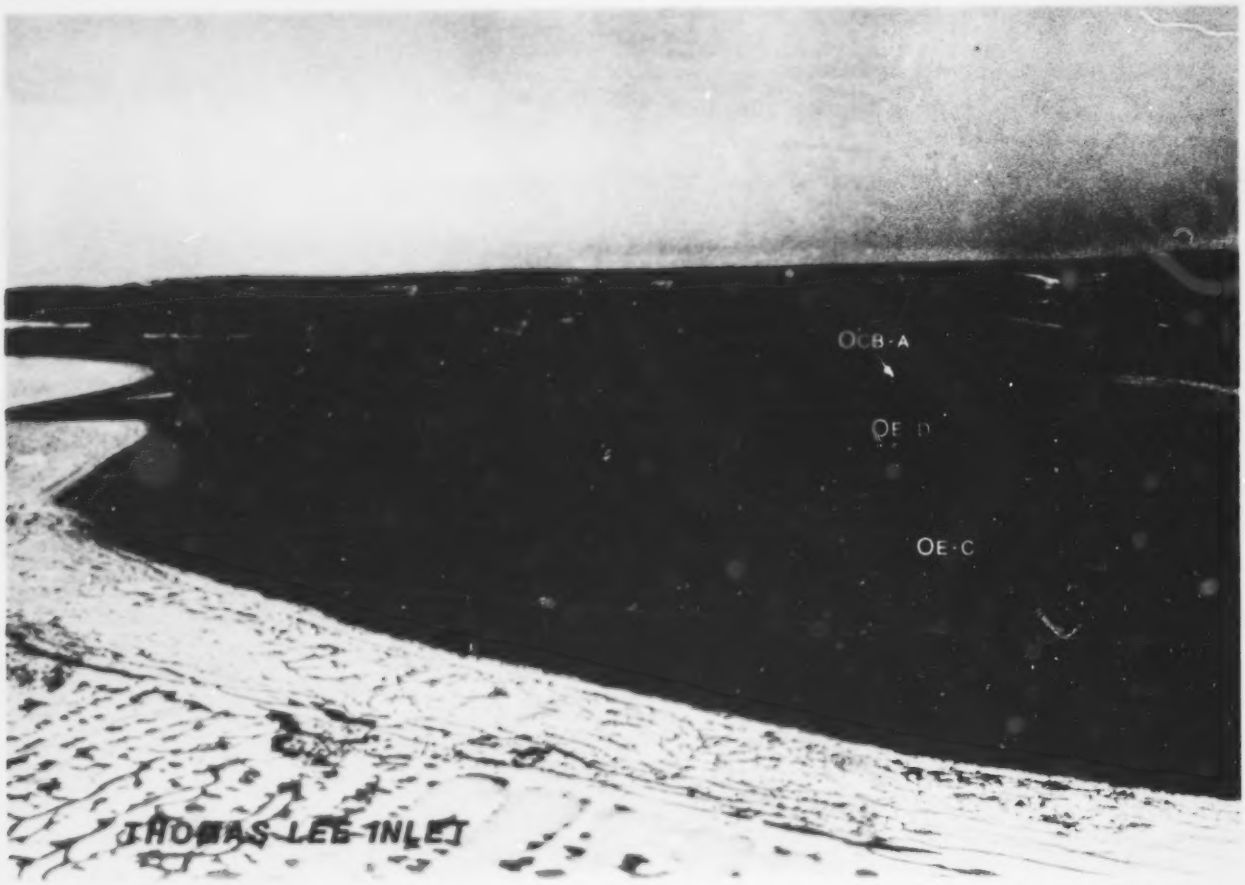

Figure 45. *Prominent headland about 9 km southeast of Skruis Point on the east side of Thomas Lee Inlet on the north coast of Devon Island (**Bear Bay West**). View is to the northeast. The headland exhibits a completely exposed section of the uppermost member of the Eleanor River Formation (OE-D); but the section is partly inaccessible owing to the steep cliff face. OE-C = member C of Eleanor River Formation; OCB-A = basal gypsum-anhydrite member of the Bay Fiord Formation.*

GSC loc. C-77271; member A; 31.9-34.6 m above base

Diaphorodus delicatus Branson and Mehl
?*"Acodus" deltatus* Lindström
"A." n. sp.
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus? gracilis (Branson and Mehl)
?*Microzarkidina adentata* McTavish
Oepikodus intermedius Serpagli
Scolopodus gracilis Ethington and Clark
S. quadraplicatus Branson and Mehl s.f.
S. robustus Ethington and Clark s.f.
S. triplicatus Ethington and Clark s.f.

Remarks: The drepanodan and scolopodan elements of this fauna are typical of Fauna D (Ethington and Clark, 1971). Additional components of the fauna are most similar to forms of Arenigian age reported from the Emanuel Formation of Western Australia (McTavish, 1973). The sample is of middle Canadian (Arenigian) age.

GSC loc. C-77276; member B; 54.4-55.4 m above base of formation

Diaphorodus delicatus Branson and Mehl
?*"Acodus" deltatus* Lindström
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oepikodus sp.
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. emarginatus Barnes and Tuke s.f.
S. quadraplicatus Branson and Mehl
S. robustus Ethington and Clark s.f.
S. triplicatus Ethington and Clark s.f.
S. n. sp. 1
S. n. sp. 2
Ulrichodina abnormalis (Branson and Mehl)

Remarks: This fauna is similar to that of sample C-77271, and assignable to Fauna D (Ethington and Clark, 1971). *Oepikodus* is represented by a single oepikodiform

element and the species cannot be determined. The two species of "*Acodus*" are similar, but "*A.*" *deltatus* is morphologically similar to the material so described by McTavish (1973). *S.* n. sp. 1 is known from members 2 and 3 of the Eleanor River Formation elsewhere in the Arctic Islands (Nowlan, 1976). *S.* n. sp. 2 is a previously unreported form. The sample is of middle Canadian (Arenigian) age.

GSC loc. C-77282; member C; 101.3 m above base of formation.

"Acodus" sp.
Belodella sp.
Cornuodus cf. *C. longibasis* (Lindström)
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Juanognathus? sp.
Oepikodus communis (Ethington and Clark)
Oistodus multicorrugatus Harris
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. gracilis Ethington and Clark
S. n. sp. 1
New Genus A Sweet, Ethington and Barnes

Remarks: *O. communis* and *O. multicorrugatus* are characteristic of both Fauna E (Ethington and Clark, 1971) and Fauna I (Sweet et al., 1971), of late Canadian and early Whiterockian age respectively. *Belodella* is represented by a single specimen and specific determination is not possible. The forms assigned to *Juanognathus?* are previously unreported. Other drepanodan and scolopodan elements are long ranging, characteristic of the upper half of the Canadian, and some extend into the Whiterockian. The sample is of late Canadian - early Whiterockian (late Arenigian) age.

GSC loc. C-77286; top of member C; 142.4-150.9 m above base of formation

Coleodus? sp.
Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oistodus multicorrugatus Harris
O. scalenocarinatus Mound
"Scolopodus" asymmetricus Barnes and Poplawski
S. emarginatus Barnes and Tuke
S. gracilis Ethington and Clark
New Genus A Sweet, Ethington and Barnes
New Genus B Sweet, Ethington and Barnes

Remarks: *O. multicorrugatus* and *O. scalenocarinatus*, together with New Genera A and B are all characteristic of late Canadian and early Whiterockian strata, Fauna E (Ethington and Clark, 1971) and Fauna I (Sweet et al., 1971) respectively. The scolopodan elements of the fauna range from middle Canadian to Whiterockian. The element referred to *Coleodus?* sp. may be related to the element referred to *?Chosonodina* sp. in sample C-77140 (section 7). Both of these samples are of approximately the same age, i.e. late Canadian - early Whiterockian.

Section 7

GSC loc. C-77123; member A; 8 m below top

Acodus sp.
Drepanoistodus sp.
Oepikodus cf. *O. intermedius* (Serpagli)
Scolopodus n. sp. 1

Remarks: The elements referred to *O.* cf. *O. intermedius* differ from typical representatives of the species in having a less sinuous anterior outline and lack of an upturn at the distal end of the posterior process. *O. intermedius* itself has been recovered from Arenigian strata of Argentina (Serpagli, 1974). The elements referred to *Scolopodus* are conspecific with a new species of the genus recovered from members 2 and 3 of the Eleanor River Formation, western Devon Island (Nowlan, 1976). The sample is probably of middle Canadian (Arenigian) age based on the presence of *O.* cf. *O. intermedius*.

GSC loc. C-77124; member A; 0.5 m below top

"Acodus" delicatus Branson and Mehl
Scolopodus n. sp. 1

Remarks: Most of the elements belong to the multielement species "*A.*" *delicatus*, which is known from the Jefferson City Formation of Missouri (Branson and Mehl, 1933). Ethington and Clark (1971, p. 76) have pointed out that these conodonts are not from the Jefferson City Formation s.s. Whatever the correct formation name, Branson and Mehl's (1933) fauna is generally similar to Fauna D of Ethington and Clark (1971). Thus, (based on this limited evidence) the sample may be of middle Canadian (Arenigian) age.

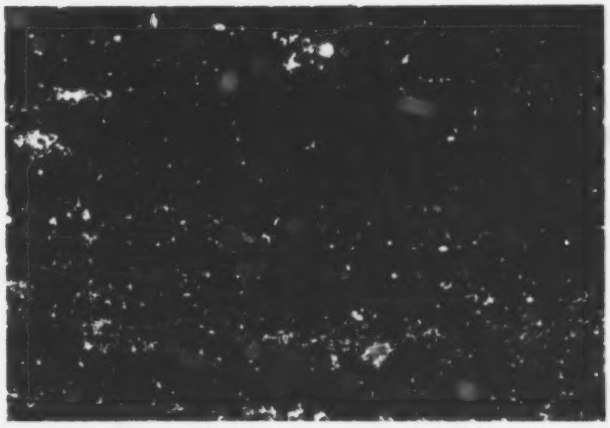

Figure 46. *Photomicrograph of limestone from member D of the Eleanor River Formation. This is a laminated, slightly clotted lime mudstone. The light coloured specks, concentrated in laminae, originated as medium crystalline euhedrons of dolomite, but the original dolomite has been replaced by finely crystalline calcite. (C-77238, section 29, Fig. 9; composite stratigraphic section B, unit 181.)*

Figure 47. *Complete section of the Bay Fiord Formation (OCB) at the west entrance to Burnett Inlet (**Powell Inlet**). View is to the west. Crossed hammers are located on the approximate centre of traverse along which section 19 (Fig. 9) was measured. X marks a unit of anhydrite 85.5 m thick near the base of the Bay Fiord Formation.* OE *= Eleanor River Formation; A, B, C and D designate members of the formation;* OCT *= Thumb Mountain Formation.*

GSC loc. C-77126; member B; 6.3 m above base

Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
"Scolopodus cornutiformis" Branson and Mehl s.l.

Remarks: This fauna is typical of Fauna D Ethington and Clark (1971) but the taxa range higher. The sample is of Canadian age, probably middle Canadian.

GSC loc. C-77137; member C; 4.7 m above base

?*"Acodus" delicatus* Branson and Mehl
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Juanognathus n. sp.
Oepikodus communis (Ethington and Clark)
Oistodus multicorrugatus Harris
O. scalenocarinatus Mound
O. n. sp.
"Scolopodus" asymmetricus Barnes and Poplawski
"S. cornutiformis" Branson and Mehl s.l.
S. gracilis Ethington and Clark
S. n. sp. 1
New Genus B Sweet, Ethington and Barnes

Remarks: The diverse fauna is indicative of late Canadian and early Whiterockian age (Fauna E of Ethington and Clark, 1971 and Fauna 1 of Sweet et al., 1971). *O. communis* and *O. multicorrugatus* are the characteristic species of this interval. Several of the representatives of Fauna D continue up into the younger faunas. The new species of *Juanognathus* and *Oistodus* are not known from elsewhere. Nowlan (1976) recognized this general association of species from member 3 of the Eleanor River Formation of western Devon and Ellesmere islands. The age of the sample is late Canadian to early Whiterockian – much younger than equivalent stratigraphic levels in the Eleanor River Formation elsewhere (Barnes, 1974; Nowlan, 1976).

GSC loc. C-77139; member C; 31.7 m above base

Acontiodus curvatus Mound s.f.
Distacodus symmetricus Mound s.f.
Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oistodus multicorrugatus Harris
O. scalenocarinatus Mound
"Scolopodus" asymmetricus Barnes and Poplawski
S. emarginatus Barnes and Tuke
S. gracilis Ethington and Clark
Ulrichodina sp.
New Genus A Sweet, Ethington and Barnes
New Genus B Sweet, Ethington and Barnes

Remarks: This fauna contains many elements common to the Joins Formation of Whiterockian age (Mound, 1965). New Genus A and New Genus B are characteristic of strata of early Whiterockian age (Faunas 1, 2 of Sweet et al., 1971). The oistodan representatives in the fauna range throughout the Whiterock. The sample is of Whiterockian, probably early Whiterockian age. Elsewhere in the Arctic Islands, the fauna is typical of the highest part of the Eleanor River Formation (Barnes, 1974; Nowlan, 1976).

GSC loc. C-77140; member C; 48.7 m above base

Acodus sp.
?Chosonodina sp.
Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus suberectus (Branson and Mehl)
?Oistodella sp.
Oistodus multicorrugatus Harris
O. scalenocarinatus Mound
"Scolopodus" asymmetricus Barnes and Poplawski
Scolopodus emarginatus Barnes and Tuke
S. gracilis Ethington and Clark
Ulrichodina sp.
New Genus A Sweet, Ethington and Barnes
cf. New Genus A Sweet, Ethington and Barnes
New Genus B Sweet, Ethington and Barnes

Remarks: Several taxa recovered from this sample (the oistodan species, New Genera A and B of Sweet et al., 1971) are typical of strata of early Whiterockian age, Faunas 1, 2 of Sweet et al. (1971). The sample is probably of about the same age as GSC loc. C-77139. The elements referred to as possible *Chosonodina* and *Oistodella* are new, denticulate, symmetrical and asymmetrical blade-like elements. The forms compared with New Genus A Sweet et al. are similar to typical representatives of New Genus A but the posterior process of all elements is denticulate.

Section 11

GSC loc. C-79414; basal 7 cm of member A

Drepanodus parallelus Branson and Mehl
Drepanoistodus? gracilis (Branson and Mehl)
Scolopodus quadraplicatus Branson and Mehl s.f.
S. triplicatus Ethington and Clark s.f.
Ulrichodina abnormalis (Branson and Mehl)

Remarks: This fauna is typical of Fauna D of Ethington and Clark (1971) although several of the taxa range into younger strata. However, *U. abnormalis* is restricted to the middle Canadian. The age of the sample is middle Canadian (Arenigian). This particular association of species is typical of member I of the Eleanor River Formation elsewhere in the Arctic Islands (Nowlan, 1976).

GSC loc. C-79415; 0.5 m above base of member A

Drepanodus parallelus Branson and Mehl s.f.
D. toomeyi Ethington and Clark s.f.
Drepanoistodus sp.
Oistodus cf. *O. longiramis* Lindström s.f.
Oistodus sp. s.f.
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. quadraplicatus Branson and Mehl s.f.
S. robustus Ethington and Clark s.f.
S. triplicatus Ethington and Clark s.f.
Ulrichodina abnormalis Branson and Mehl
New Genus, n. sp.

Remarks: This fauna is similar in most respects to that of GSC loc. C-79414. The new genus has been recorded from the middle part of the Eleanor River Formation (Nowlan, 1976, New Genus 4). *O.* cf. *O. longiramis* may be a portion of a species of the multielement genus *Oepikodus* Lindström which occurs widely in the Arenigian of the North Atlantic Province. The most common representative is *O. communis*, which occurs in strata of late Canadian and Whiterockian age. Thus, the fauna is largely of middle Canadian (Arenigian) aspect but may range into the late Canadian (late Arenigian).

Section 28

GSC loc. C-77400; member A; 48.0 m below top

Acodus sp.
Clavohamulus n. sp.
Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Oepikodus intermedius Serpagli
"Scolopodus" asymmetricus Barnes and Poplawski
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. gracilis Ethington and Clark
S. cf. *S. quadraplicatus* Branson and Mehl s.f.

Remarks: The scolopodan and drepanodan components of this fauna are characteristic of Fauna D and E (Ethington and Clark, 1971), of middle to late Canadian age. *O. intermedius* has been reported by Serpagli (1974) from strata of Arenigian age in Argentina; its stratigraphic range is poorly known. The forms referred to *Clavohamulus* sp. and New Genus 1 have been reported from the lower part of the Eleanor River Formation elsewhere in the Arctic Islands (Nowlan, 1976). The sample is of middle to late Canadian age.

GSC loc. C-77224; member B; 25.4 m above base

Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Eoneoprioniodus? akpatokensis Barnes s.l.
Scolopodus cornutiformis Branson and Mehl s.s.

Remarks: This immensely prolific fauna is composed almost entirely of *E.? akpatokensis*. This form is closely similar to material described as *"Acodus" delicatus* Branson and Mehl in other samples. The elements recovered here belong to a species of middle Canadian age, which is common in Fauna D. The same taxon is known from middle and upper parts of the Eleanor River Formation elsewhere in the Arctic Islands (Nowlan, 1976). The sample is of middle Canadian (Arenigian) age.

GSC loc. C-77229; member C; 16.4 m above base

"Acodus" sp.
Drepanoistodus? gracilis (Branson and Mehl)
Oistodus multicorrugatus Harris
"Scolopodus" asymmetricus Barnes and Poplawski
S. gracilis Ethington and Clark
Ulrichodina sp.
New Genus A Sweet, Ethington and Barnes

Remarks: The fauna is numerically dominated by *Scolopodus gracilis* which is a long-ranging taxon. *O. multicorrugatus* and New Genus A are both characteristic of latest Canadian and early Whiterockian strata, Fauna E (Ethington and Clark, 1971) and Fauna 1 (Sweet et al., 1971) respectively. A single fragment attributable to *Ulrichodina* is present but is not identifiable at the specific level. This association of species is known from the upper part of the Eleanor River Formation of western Devon and Ellesmere islands (Nowlan, 1976). The sample is of late Canadian - early Whiterockian age.

Section 29

GSC loc. C-77230; member C; 19.5-22.5 m below top of formation

Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus? gracilis (Branson and Mehl)
Microzarkodina? sp.
Oepikodus communis (Ethington and Clark)
Oistodus multicorrugatus Harris
O. sp. s.f.
"Scolopodus" asymmetricus Barnes and Poplawski
"Scolopodus cornutiformis" Branson and Mehl s.l.
S. gracilis Ethington and Clark
S. n. sp. 1
Ulrichodina n. sp.
New Genus B Sweet, Ethington and Barnes

Remarks: This fauna is essentially similar to that of sample C-77282. *O. communis* and *O. multicorrugatus* are characteristic of Fauna E (Ethington and Clark, 1971) of late Canadian age and Fauna 1 (Sweet et al., 1971) of early Whiterockian age. The specimens tentatively assigned to *Microzarkodina* are similar to those described as *?M. adentata* (sic) by McTavish (1973). New Genus B is characteristic of strata of early Whiterockian age. The remainder of the fauna is typical of middle to late Canadian and early Whiterockian strata. The age of the sample is late Canadian to early Whiterockian.

Section 29

GSC loc. C-79439; member D; 5.2 m above base

Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus sp.
Oistodus sp.
Scolopodus gracilis Ethington and Clark s.f.

Remarks: The limited fauna recovered from this sample comprises taxa that range through Faunas D and E of Ethington and Clark (1971). Both *D. parallelus* and *S. gracilis* range into strata of Whiterockian age. This long-ranging assemblage indicates an age between late Canadian and Whiterockian (middle Arenigian to early Llanvirnian). Elsewhere in the Arctic Islands these taxa are present in strata of the Eleanor River Formation and occur locally near the top of the Baumann Fiord Formation (Nowlan, 1976).

GSC loc. C-77239; member D; 13.7-16.7 m above base

Drepanodus parallelus Branson and Mehl s.f.
Scolopodus gracilis Ethington and Clark
S. quadraplicatus Branson and Mehl s.f.

Remarks: This meagre fauna is comprised of long-ranging taxa of mid-Canadian to early Whiterockian age. This group of simple cones is most common in the middle to late Canadian.

GSC loc. C-79440; member D; 56 m above base

Acodus campanula Mound s.f.
Drepanodus parallelus Branson and Mehl s.f.
Drepanoistodus suberectus (Branson and Mehl)
?Multioistodus subdentatus Cullison
Scandodus sinuosus Mound s.f.
New Genus B Sweet et al., 1971
New Genus C Sweet et al., 1971

Remarks: This fauna includes several species characteristic of Whiterockian strata, Faunas 1 through 4 of Sweet et al. (1971). There are representatives of each of Faunas 1 through 4 in the sample, indicating a Whiterockian (latest Arenigian to Llanvirnian) age. This assemblage is characteristic of the lower part of the Bay Fiord Formation elsewhere in the Arctic Islands (Nowlan, 1976).

Correlation

Dundas Harbour. It will be recalled from a previous discussion that the lower part of the type section of the Nadlo Point Formation, as defined by Kurtz et al. (1952) at Dundas Harbour, corresponds to a mostly covered interval that is underlain by the newly established Blanley Bay Formation. The Eleanor River Formation, shown here as section 2, was probably measured in the beds that Kurtz et al. (*op. cit.*) designated as the upper part of the type section of the Nadlo Point. For one thing, the detailed description by Kurtz et al. (*op. cit.*) of the beds in the upper part of the Nadlo Point match reasonably well those given in the present account for the Eleanor River. For another, Kurtz et al. (*op. cit.*, p. 645) make special mention of the fact that "The upper 250 feet of the Nadlo Point form three conspicuous cliffs separated from each other by relatively thin, less resistant limestone", and the three cliffs – they are more appropriately referred to as ledges – are clearly visible in the outcrops where section 2 of the Eleanor River was measured (Fig. 38). It might appear, therefore, that the Eleanor River equates one for one with the upper part of the Nadlo Point. There is, however, a strong possibility that Kurtz et al. (*op. cit.*) were partly in error in their statement that implies that the exposures characterized by the "three conspicuous cliffs" belonged entirely within the Nadlo Point, and that, in fact, these exposures also include beds belonging to the lower part of the overlying Croker Bay Formation. It is necessary, therefore, at this juncture to deal with the Croker Bay Formation, and so the salient characteristics of this formation, as defined by Kurtz et al. (*op. cit.*), are presented in the following paragraph.

The Croker Bay represents the youngest of the six formations erected at Dundas Harbour by Kurtz et al. (1952). It is said to consist mainly of limestone. The type section of the formation is situated along the same valley wall of the Mingo River as that of the Nadlo Point, but about 2 km farther upstream (see Figure 16). Kurtz et al. (*op. cit.*) did not observe the upper contact of the formation. According to these authors, the highest part of the Croker Bay is the present-day erosion surface on the prominent mesa to the northwest of the Mingo River. The total thickness of the formation as observed by Kurtz et al. (*op. cit.*) is given as 423.83 m. The described type section includes 13 units of rock and 3 specified covered intervals. The stratigraphically lowest 12 units of rock (which include the 3 covered intervals) are described in considerable detail and total 88.5 m in thickness. Of special interest concerning this 88.5 m interval is the statement by Kurtz et al. (*op. cit.*, p. 640) that the top of unit 12 "forms a structural terrace at the locality of the measured section". The significance of this terrace will be discussed later. Unit 13 is said to be 335.28 m thick, and as such it represents the greater part of the Croker Bay. In contrast to the lower 12 units, the description of unit 13 is obviously cursory, and seems to imply that the unit is largely covered. The description of unit 13 is quoted here in full: "Limestone, light brownish grey, fine-grained, medium- to thin-bedded. This unit extends to the top of the ridge immediately west of Mingo River. Abundant loose blocks show strong lithologic similarity to underlying beds. *Maclurites* and *Receptaculites arcticus* found at summit of the ridge appear to have been derived from beds forming the top part of the ridge. Bottom few feet are probably shaly. Unit forms steep slopes . . . 1100.0". The figure of 1100.0 refers to the total thickness of the unit in feet.

The stratigraphy of the territory that includes the type sections of the Croker Bay and Nadlo Point formations, as interpreted by the present authors, is as follows: The Eleanor River Formation shown as section 2 is 150.9 m thick, and in spite of the fact that the lower and upper contacts are marked by covered intervals, the section appears to represent a nearly complete thickness of that formation. The covered interval at the top of the Eleanor River is 128 m thick, and is overlain by about 45 m of resistant brownish limestone replete with *Maclurites* sp. and *Receptaculites* sp. This resistant limestone is assigned to the Thumb Mountain Formation and constitutes the cliff-maker that has resulted in the mesa on the northwestern side of Mingo River. There can be no doubt that the uppermost beds referred to the Croker Bay Formation equate with beds within the Thumb Mountain. In fact, the 45 m of brownish limestone represent a thin but nearly complete section of that formation at this locality. There is also no doubt that the covered interval of 128 m between the top of the Eleanor River and the bottom of the Thumb Mountain is underlain by a full section of the Bay Fiord Formation that is nowhere exposed in the environs of the type sections of the Nadlo Point and Croker Bay formations. It is also possible that the covered interval may include member D of the Eleanor River Formation. The Bay Fiord consists mainly of nonresistant dolomite where it has been observed in the Dundas Harbour region.

The most difficult problems in attempting to reconcile the stratigraphy of the beds in question here at Dundas Harbour, as classified by Kurtz et al. (1952) and the present authors, are those related to thickness of rock units and covered intervals, and the question of how the stratigraphically lowest 12 of the 13 units of rock ascribed to the Croker Bay Formation by Kurtz et al. (*op. cit.*) relate to the Eleanor River - Bay Fiord - Thumb Mountain formations described herein. Three circumstances suggest strongly that the 12 units of rock in question here equate with the upper part of the Eleanor River Formation shown in section 2, and measured at the type locality of the Nadlo Point Formation:

1. The described lithological characteristics of the lowermost 12 units of the Croker Bay Formation are similar in general to those of the upper part of the Eleanor River Formation given herein. They are, moreover, as noted by Kurtz et al. (*op. cit.*), similar in general to those of the Nadlo Point.

2. The total thickness of beds included in the lowermost 12 units of rock (and the three covered intervals) in the Croker Bay is, according to Kurtz et al. (*op. cit.*), 88.5 m. Adding this figure to the 76.8 m (252 ft) that these same authors have ascribed to the upper part of the type section of the Nadlo Point produces a total thickness of 164.7 m, which is in close agreement with the 150.9 m assigned at section 2 to the Eleanor River Formation.

3. The top of the Eleanor River where section 2 was measured, by virtue of the overlying nonresistant Bay Fiord Formation, forms a prominent structural terrace – the only such physiographic feature in this area – that can be readily traced from the type locality of the Nadlo Point Formation to and beyond the type section of the Croker Bay Formation (Fig. 16). It would appear, therefore, that this is the same structural terrace noted by Kurtz et al. (*op. cit.*) that occurs at the top of unit 12 in their described section of the Croker Bay Formation. Moreover, the structural terrace is developed on the uppermost of the "three conspicuous cliffs" that, according to Kurtz et al. (*op. cit.*), characterized the upper part of the type section of the Nadlo Point Formation. Furthermore, all three cliffs can be traced from that type section to and beyond the type section of the Croker Bay Formation.

In summary:

1. Kurtz et al. (1952) were partly in error when they considered the exposures with the "three prominent cliffs" as belonging entirely within the upper part of the type section of the Nadlo Point Formation.

2. The contact of the Nadlo Point with the Croker Bay Formation is, in fact, situated in about the middle of this particular interval of beds.

3. The upper part of the Nadlo Point equates with the lower part of the Eleanor River Formation, whereas the lower part of the Croker Bay equates with the upper part of the Eleanor River.

4. The remainder of the Croker Bay [represented by the uppermost stratigraphic unit, 335.28 m thick, in the type section of the type section as described by Kurtz et al. (*op. cit.*)] equates with a full thickness of the Bay Fiord Formation and a nearly complete thickness of the Thumb Mountain Formation.

5. The thickness of 335.28 m for the uppermost unit of the Croker Bay is probably in error. The thickness of this stratigraphic interval, as determined by the present investigation, is 173 m.

In the nearly three decades that have elapsed since the appearance of the Kurtz et al. publication (1952), it has not been possible to recognize the Nadlo Point and Croker Bay formations outside the limited region in which they were

defined. The reason for this is now obvious. The surfaces of separation bounding these formations have no regional significance by which they might qualify as mappable contacts. The beds included in the Nadlo Point and Croker Bay are, according to the present account, distributed in the Blanley Bay, Eleanor River, Bay Fiord and Thumb Mountain formations, which, excepting the Blanley Bay, are firmly established in the literature and are widely distributed throughout the archipelago. Consequently, in spite of the priority of the formation names of Nadlo Point and Croker Bay, we recommend that their use be discontinued.

Greenland. The Eleanor River Formation is probably correlative with three relatively resistant formations that consist mainly of limestone in northwestern Greenland. They are, in ascending stratigraphic order, the Nygaard Bay, Canyon Elv, and Nunatami formations, all of which have been assigned a late Canadian age (see Peel and Cowie, 1979; and references contained therein).

Middle Ordovician

Bay Fiord Formation

Definition and distribution

The Bay Fiord Formation is made up chiefly of carbonate and evaporitic rocks that were earlier considered to comprise the lower part of the Cornwallis Formation. The Cornwallis Formation was defined on Cornwallis Island by Thorsteinsson (1958), who noted that the formation was divisible into three main lithological units. Kerr (1967a), recognizing that the Cornwallis Formation included three mappable rock units throughout the Franklinian Miogeosyncline of Ellesmere Island, raised the formation to the status of a group that included, in ascending stratigraphic order, the Bay Fiord, Thumb Mountain and Irene Bay formations. The type sections selected by Kerr for all three formations occur in a single continuous stream section about 30 km north-northeast of the head of Irene Bay in central Ellesmere Island. There the Bay Fiord Formation is about 510 m thick.

Outcrops of the Bay Fiord Formation are widely distributed in the Franklinian Miogeosyncline. They occur from Ellesmere Island in the northwest (Kerr, 1967a, 1968) to Grinnell Peninsula (Morrow and Kerr, 1977), Cornwallis Island (Thorsteinsson and Kerr, 1968), and Bathurst Island (Kerr, 1974) in the southwest. In the Arctic Platform, outcrops of the Bay Fiord have been identified only on Somerset Island (Miall and Kerr, 1980) and on Devon Island.

Throughout most of its areal extent, the Bay Fiord consists mainly of limestone and/or dolomite, which is commonly argillaceous or silty, and of evaporitic rocks. The formation is also characterized by: the recessive nature of its outcrops; the overall greenish weathering colours of the carbonate rocks, particularly as viewed from a distance; and the marked regional changes in the proportions of carbonate and evaporitic rocks, so much so that, in some places, the formation consists entirely of carbonate rocks, whereas in others it is largely composed of evaporitic rocks. Other aspects that are of particular interest are:

1. The presence of thick halite deposits in the subsurface of Bathurst Island (Kerr, 1974; Mayr, 1980);
2. The possibility that the Bay Fiord served as the surface of decollement throughout the Parry Islands Foldbelt; and
3. The fact that the formation is widely distributed in the subsurface of both Bathurst and Melville islands, an idea advanced for the first time by Workum in 1965.

The Bay Fiord Formation on Devon Island occurs in three main regions: the largest of which is the northerly striking and westerly dipping belt of exposures that extends from Maxwell Bay in the south (*Maxwell Bay*) to Thomas Lee Inlet in the north (*Bear Bay West*); the half graben centred around Burnett Inlet (*Powell Inlet*); and the two half grabens between Croker Bay and Dundas Harbour (*Dundas Harbour*). Small exposures of the formation occur some 7 km south of Boat Point, and in the much faulted terrane of the Haughton crater (*Bear Bay West*).

Lithology and thickness

Four measured sections (6, 19, 31, 33) of the Bay Fiord Formation are shown on Figure 9. They show that the formation thickens markedly from the east to west. The easternmost described section of the formation (section 6) that occurs on the east side of Croker Bay is 173.0 m thick. But the formation is clearly even thinner a few kilometres to the east at Dundas Harbour where, although entirely covered, it is demonstrably not more than 128 m thick (section 2). The formation is thickest in the environs of Thomas Lee Inlet, where it is estimated to be about 290 m thick (sections 31, 33).

The basal contact of the Bay Fiord Formation is sharply defined. It corresponds to the break between carbonate rocks of the underlying Eleanor River Formation and evaporitic rocks in the base of the Bay Fiord (see figures 45, 47).

The Bay Fiord is divisible into four broad units of regional extent. These are considered as informal members and designated A to D, in ascending stratigraphic order.

Member A comprises mostly medium crystalline anhydrite and secondary gypsum, occurring as nodules in dolomite or in fissures in anhydrite. In westernmost exposures of the member (sections 31, 33) the anhydrite is generally laminated, whereas at Burnett Inlet (section 19) nodular varieties predominate. Evaporitic rocks apparently are absent on the east side of Croker Bay (section 6), but it is noteworthy that substantial amounts of solution breccia are present, suggesting the presence there of beds correlative with member A.

The basal part of the member consists mainly of anhydrite that tends to stand out conspicuously in well exposed sections, but sequentially higher beds are characterized by numerous interbeds of dolomite. The dolomite is commonly thin bedded, and very finely to finely crystalline. One example exhibited intraclast grainstone textures with bird's-eye structure. Dedolomitization was observed in beds that appear to represent this member east of Croker Bay (section 6). Minor amounts of sandy dolomite also are present in this member. The only organic remains observed in member A were silicified stromatolites at the base of section 33.

Member B, as developed west of the *Dundas Harbour* map area, consists mainly of recessive weathering dolomite that is very thin to thin bedded and very finely crystalline

to finely crystalline. The principal fresh surface colours range from medium grey to dark grey, and the prevailing weathering colours are medium grey to greyish green. Lower parts of the member include interbedded and interlaminated gypsum, whereas higher parts contain silty impurities along with shale that is present as discrete interbeds or bedding plane partings. Minor interbeds of intraclasts and pellets also occur as thin graded units with intraformational granule conglomerate at the base (Fig. 48). The terrigenous materials appear to increase from west to east. Thus, at Thomas Lee Inlet (section 31) only the uppermost few metres of the member contain shale; at Burnett Inlet (section 19) the upper half is markedly silty; whereas on the east side of Croker Bay (*Dundas Harbour*; section 6), dolomitic siltstone and shale constitute the dominant lithologies throughout. The member is mainly planar bedded; other sedimentary structures include rare ripple marks, synaeresis cracks and halite casts. The members appear to be devoid of megafossils. At one locality, 0.9 m of skeletal, very finely crystalline dolomite was observed.

Member C is a relatively thin and resistant unit of dolomite that forms a conspicuous marker in well exposed sections of the formation. The dolomite is mainly medium to thick bedded and finely to medium crystalline. The overall weathering colour is a medium reddish orange. The member contains minor amounts of dolomitic mottled limestone in the environs of Thomas Lee Inlet (section 31). The limestone consists of lime mudstone and skeletal wackestone, and skeletal fragments are also discernible in the dolomite. Intraclasts are rare. The member is profusely burrowed and bioturbated. Corals, brachiopods, bryozoans and fragments of echinoderms are locally very abundant, but too poorly preserved to permit identification. Fragmentary remains of trilobites (C-77080) in section 31 were identified as aff. *Bavasilla* sp. and *Calyptaulax* sp. by B.S. Norford.

Member D is lithologically similar in most respects to the upper part of member B. It consists of dolomite that is very thin to thin bedded, finely crystalline, and medium to dark grey. The overall weathering colours are shades of green. The dolomite in easternmost sections is silty and argillaceous (in one specimen, C-77363, in section 6, X-ray analysis indicated three per cent chlorite), but the amount of these impurities decreases westward. The member is unfossiliferous, except for some minor amounts of skeletal debris in the uppermost beds.

At the west side of Thomas Lee Inlet, member D is penetrated by a small solution pipe consisting of carbonate boulders up to 2 m in diameter embedded in a gypsiferous matrix (Fig. 49). Conodonts (C-77240) from one of the boulders indicate that it was derived from either the overlying Thumb Mountain or the Allen Bay Formation.

Age

The conodonts obtained from the Bay Fiord are listed below. Identifications and age determinations were by G.S. Nowlan. The conodonts indicate that the formation ranges from about Faunas 2 or 4 to Faunas 6 or 7 of Sweet et al. (1971), and as such the age range of the formation is Whiterockian to Blackriverian (Middle Ordovician; see Table 2).

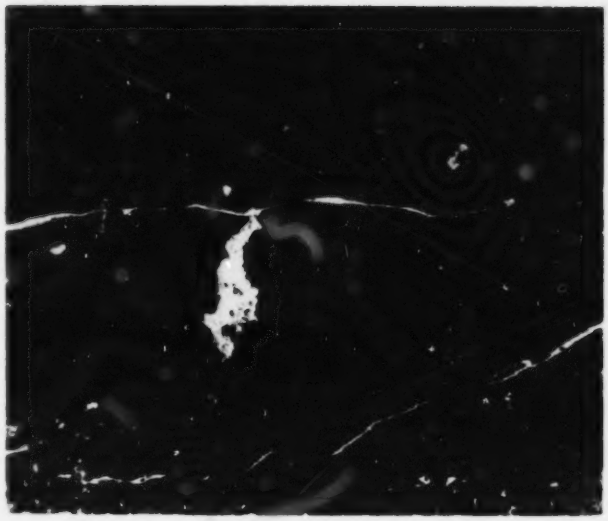

Figure 48. *Photomicrograph of dolomite from member B of the Bay Fiord Formation. A striking feature of this dolomite is its graded laminae. The bases of the laminae consist of medium sand to granule-sized intraclasts forming grainstone or rudstone; the middle parts are pelletal grainstone with gypsum or dolomite cement; while the upper parts are composed of very fine dololutite and fine silt-sized clasts. (C-77076, section 31, Fig. 9; composite stratigraphic section B, unit 235.)*

Section 6

GSC loc. C-77362; member C; 7.1 m above base

Belodella cf. *B. jemtlandica* Löfgren
Curtognathus sp.
Distacodus cf. *D. symmetricus* Mound s.f.
Drepanoistodus suberectus (Branson and Mehl)
Erismodus abbreviatus Branson and Mehl
Oulodus aff. *O. restrictus* Moskalenko
Phragmodus flexuosus Moskalenko
Scandodus cf. *S. sinuosus* Mound s.f.

Remarks: *P. flexuosus* is characteristic of strata of Chazyan age, Faunas 5 and 6 (Sweet et al., 1971; Sweet and Bergström, 1976). Typical *B. jemtlandica* was reported by Löfgren (1978) from the early Llanvirnian. The specimens compared with it herein are conspecific with a species of *Belodella* recovered by Nowlan (1976) from the middle and upper part of the Bay Fiord Formation. The sample is of Middle Ordovician (Chazyan; late Llanvirnian to Llandeilian).

GSC loc. C-77364; member D; top of member

Appalachignathus delicatulus Bergström et al.

Figure 49. *Pipe of solution breccia in the Bay Fiord Formation on the west side of Thomas Lee Inlet, north coast of Devon Island (Station 30,* ***Bear Bay West****).*

Drepanoistodus suberectus (Branson and Mehl)
Oulodus n. sp.
Panderodus aff. *P. gracilis* (Branson and Mehl)
Paroistodus aff. *P. mutatus* (Branson and Mehl)
Plectodina? sp.

Remarks: *A. delicatulus* ranges through Fauna 6 and into the lower part of Fauna 7 of Sweet et al. (1971). It is also known in the North Atlantic Province, where it ranges from the upper part of the *Pygodus serrus* Zone through the base of the *Amorphognathus tvaerensis* Zone of Bergström (1971) (Bergström et al., 1974). This range is equivalent to Chazyan to Blackriverian (late Llanvirnian to early Caradocian). Faunas of this type have been recovered from the uppermost Bay Fiord and lowermost Thumb Mountain formations (Nowlan, 1976). Ranges of other taxa in the sample are either long or poorly known.

Section 19

GSC loc. C-77412; member B; 40.1-40.7 m above base

Acontiodus curvatus Mound s.f.
Coleodus confinis Moskalenko
C. n. sp.
Distacodus symmetricus Mound s.f.
Multioistodus cryptodens (Mound)
M. subdentatus Cullison
M. n. sp.
Polycaulodus sp.
Scandodus sinuosus Mound s.f.
Stereoconus robustus Branson and Mehl
Tricladiodus sp.
New Genus (=N. Gen. 7, Nowlan, 1976)

Remarks: This diverse fauna has many elements in common with that of the Joins Formation (Mound, 1965) of Whiterockian age. Species of the genus *Multioistodus* numerically dominate the sample, and these are characteristic of Faunas 2 to 4 (Sweet et al., 1971). This range is shared by the simple cone taxa *A. curvatus*, *D. symmetricus* and *S. sinuosus*, all of which probably belong within a single multielement taxon (Nowlan, 1976). This fauna is closely similar to that recovered from the lower part of the Bay Fiord Formation of northwestern Devon and Ellesmere islands (Nowlan, 1976). The sample is of Whiterockian age.

GSC loc. C-77415; member B; 50.2-51.1 m above base

Acontiodus curvatus Mound s.f.
Distacodus symmetricus Mound s.f.
Erismodus n. sp.
Evencodus aff. *E. sibiricus* Moskalenko
Multioistodus n. sp.
Scandodus sinuosus Mound s.f.
New Genus n. sp.

Remarks: This hyaline fauna is very similar to that recovered from samples of the middle part of the Bay Fiord Formation on Ellesmere Island and northwestern Devon Island, where it is interspersed between samples bearing typical Chazyan forms such as *Phragmodus flexuosus*. The *Phragmodus-Belodella* association is virtually mutually exclusive of this hyaline association, implying paleoecologic control (Nowlan, 1976).

The simple cone taxa *A. curvatus*, *D. symmetricus* and *S. sinuosus*, probably all belong within a single multielement taxon, and they range through Whiterockian and Chazyan strata. The new species of *Multioistodus* reported here is identical to the new species reported in the previous sample, GSC loc. C-77412. The age of the sample, based on previous knowledge of Arctic localities, is probably Chazyan; however, the sample lacks typical representatives of Chazyan age.

GSC loc. C-77418; member D; 29.9-31.2 m above base

Distacodus cf. *D. symmetricus* Mound s.f.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
Scandodus cf. *sinuosus* Mound s.f.

Remarks: This fauna is characterized by long-ranging taxa. The sample is probably of Middle Ordovician age.

Section 31

GSC loc. C-77078; member C; 0.0-3.5 m above base

Belodella cf. *B. jemtlandica* Löfgren
Chosonodina? sp. A. Sweet, Ethington and Barnes s.f.
Coleodus cf. *C. confinis* Moskalenko
Cyrtoniodus sp.
Distacodus cf. *D. symmetricus* Mound s.f.
Drepanoistodus suberectus (Branson and Mehl)
Evencodus aff. *E. sibiricus* Moskalenko
Lonchodus spinuliferus Stauffer s.f.
Phragmodus flexuosus Moskalenko
Polycaulodus sp.
Prioniodus sp. s.f.
Ptiloconus gracilis (Branson and Mehl)
Scandodus cf. *S. sinuosus* Mound s.f.
"Scolopodus" n. sp.
New Genus n. sp. (= New Genus 7, Nowlan, 1976)

Remarks: This diverse fauna is dominated by *Phragmodus* and *Belodella*. *P. flexuosus* is characteristic of strata of Chazyan age, Faunas 5 and 6 of Sweet et al. (1971). *Chosonodina*? sp. A has been recovered from the Ship Point Formation of Baffin Island (Barnes, 1974). The fauna contains several forms known from the Volginsky and Kirensky horizons of the Siberian Platform (Moskalenko, 1970, 1973). The fauna is typical of that recovered from the middle part of the Bay Fiord of Ellesmere and northwestern Devon islands (Barnes, 1974; Nowlan, 1976). The sample is of Chazyan (late Llanvirnian-Llandeilian) age.

GSC loc. C-77081; member C; 5.0-6.8 m above base

Belodella cf. *B. jemtlandica* Löfgren
Chosonodina? sp. Sweet, Ethington and Barnes s.f.
Distacodus cf. *D. symmetricus* Mound s.f.
Drepanoistodus suberectus (Branson and Mehl)
"Oulodus" sp. (neurodont)
Phragmodus flexuosus Moskalenko
Ptiloconus gracilis (Brandon and Mehl)
Scandodus cf. *S. sinuosus* Mound

Remarks: This fauna is very similar to that of sample C-77078 and is of the same age. The diversity of this sample is lower, mainly because of a lack of neurondontiform species. On the basis of the presence of *P. flexuosus*, a Chazyan age can be assigned to this sample.

Correlation

On the basis of similarities in lithology, topographic expression, and stratigraphic position, the Bay Fiord appears to equate with the Cape Webster Formation of northwestern Greenland. In addition, what little is known about the age of the Cape Webster, which is assigned to the Chazyan, is compatible with this correlation (see Koch, 1929a, b).

Middle and Upper Ordovician

Thumb Mountain Formation

Definition and distribution

The name Thumb Mountain was applied by Kerr (1967a) to the middle formation of the Cornwallis Group. The type section of the formation is in central Ellesmere Island where it is 462 m thick and, according to Kerr, consists mainly of resistant limestone that is argillaceous, mottled, slightly dolomitic and thick bedded to massive. The formation is widely distributed in the Franklinian Miogeosyncline, outcropping from Ellesmere Island (Kerr, 1967a, 1968) in the northwest to Bathurst Island (Kerr, 1974) in the southwest. It outcrops also in the Arctic Platform of Somerset Island (Miall and Kerr, 1980). Exposures of the Thumb Mountain Formation are distributed in three principal parts of the report area; the two half-grabens between Croker Bay and Dundas Harbour (*Dundas Harbour*); the half-graben at Burnett Inlet (*Powell Inlet*); and as a narrow belt extending northward across Devon Island from the west side of Maxwell Bay (*Maxwell Bay*) to the west side of Thomas Lee Inlet (*Bear Bay West*). Smaller outcrops of the formation occur around Boat Point and in the Haughton crater of *Bear Bay West*.

Lithology and thickness

The Thumb Mountain Formation on Devon Island consists mainly of limestone and lesser amounts of dolomite. It is topographically prominent and commonly stands out in bold cliffs above the nonresistant Bay Fiord Formation (Fig. 50). The predominant weathering colours, particularly as viewed from a distance, are greyish yellow to yellowish grey, but some exposures exhibit a distinctive rust colour, and others are shades of brown.

Four measured sections (2, 6, 20, 32) of the Thumb Mountain are illustrated graphically on Figure 10. The formation is thickest in its western and southern parts. This is indicated by the fact that the smallest known thickness is 55.5 m (section 6) near Croker Bay (*Dundas Harbour*), while the thickest section is about 140 m, as measured by aneroid barometer on the west side of Maxwell Bay (*Maxwell Bay*). That the formation also thins northward is evident at section 32, southwest of Thomas Lee Inlet (*Bear Bay West*), where it was measured as 82.8 m thick.

The formation is divisible into lower and upper members at Burnett Inlet (section 20) and in exposures farther to the west (section 32). The members appear to equate respectively with the dolomite lithofacies and limestone lithofacies described by Morrow and Kerr (1977) in the northwestern part of Devon Island, outside the present report area. The lower member is apparently absent in easternmost outcrops of the formation (see sections 2, 6).

The principal lithologies of the lower member include calcareous dolomite and dolomitic limestone that are mainly medium to thick bedded, light brown to light grey, and characterized by labyrinthine mottling. The dolomite is variably finely to medium crystalline, whereas the limestone is lime mudstone with minor lenses of skeletal material. In westernmost exposures (section 32), the limestone is interbedded with dolomite that is thin bedded and aphanocrystalline to finely crystalline.

The upper member is made up chiefly of limestone, the upper part of which is mainly thick bedded to massive, whereas the lower part is mainly thin to medium bedded. The limestone comprises lime mudstone and skeletal wackestone, and it is commonly penetrated by labyrinthine, dolomitic mottling. The limestone varies from light shades of grey to brown, but the dolomitic mottling is mainly yellowish orange. Layers of skeletal packstone ranging up to coarse calcarenite size are present locally. Constituent grains include, *inter alia*, fragments of crinoids, brachiopods, bryozoans, dasycladaceans and *Girvanella* sp. Thin interbeds of small, irregular masses of limestone, embedded in greenish grey shale are present locally. These interbeds are lithologically similar to one of the principal lithologies in the overlying Irene Bay Formation, which will be described on a later page.

The Thumb Mountain is rather rich in megafossils, and it is in the upper member of this formation that the assemblage generally referred to as the Arctic Ordovician fauna makes its first appearance in the stratigraphic record of the archipelago. The fauna, which comprises mainly corals, bryozoans, brachiopods, gastropods, cephalopods, trilobites and ostracodes, is noted for the large size attained by many of its constituent species.

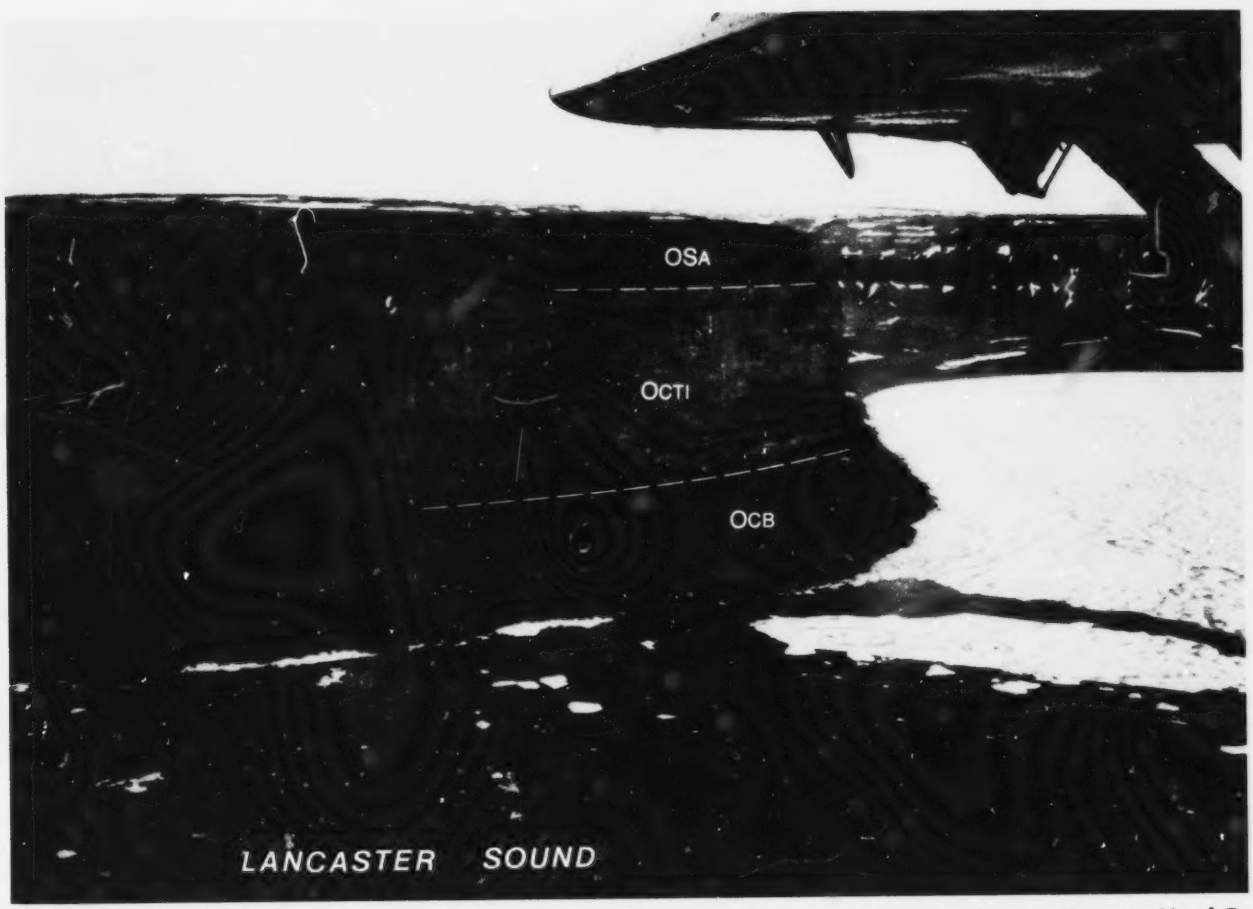

Figure 50. *Sea cliffs rising to an elevation of about 320 m at the west entrance to a small unnamed bay on the west side of Cape William Herschell, on the south coast of Devon Island (**Maxwell Bay**). View is to the north.* OCB *= Bay Fiord Formation;* OCTI *= Thumb Mountain and Irene Bay formations, undivided;* OSA *= Allen Bay Formation. The Irene Bay Formation is clearly discernible as a thin, recessive interval above the Thumb Mountain Formation.*

Basal contact

Throughout the whole of its areal extent on Devon Island, the Thumb Mountain Formation lies conformably on the Bay Fiord Formation with an abrupt contact (see figures 47, 50). In westernmost outcrops of these formations, the presence of conodonts indicative of Faunas 6 and 7 in uppermost beds of the Bay Fiord and lowermost beds of the Thumb Mountain suggests that there is no significant break in sedimentation between the formations. There is, on the other hand, both physical and faunal evidence that the contact in easternmost exposures of the formations, between Croker Bay and Dundas Harbour, is represented by an unconformity (see sections 2 and 6 on figures 9 and 10).

1. In this region, the lower member of the Thumb Mountain is apparently absent.

2. The conodonts from the lower part of the Thumb Mountain, though limited in abundance and diversity, indicate an age no older than Rocklandian (Fauna 8 of Sweet et al., 1971) and possibly as young as Richmondian.

3. On the east side of Croker Bay, where section 6 was measured, the Thumb Mountain lies on the uppermost member of the Bay Fiord, suggesting that the latter formation has not undergone significant pre-Thumb Mountain erosion. In this section, the Bay Fiord is 186 m thick. A short distance to the southeast, however, in section 2 near the head of Dundas Harbour, the Bay Fiord, though completely covered by talus, cannot be more than 128 m thick, suggesting that the unconformity there has probably cut deeply into Bay Fiord rocks.

Age

The conodonts from the Thumb Mountain appear to range from about Faunas 6 or 7 to about Fauna 11, indicating that the age range of the formation is about late Blackriverian to early Maysvillian (Middle to Late Ordovician). The conodont collections are listed below. Identifications and age determinations were made by G.S. Nowlan.

Section 2

GSC loc. C-77287; upper member; 0.8–8.8 m above base

Acodus mutatus Branson and Mehl s.f.
Belodina compressa (Branson and Mehl)
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
P. aff. *P. panderi* (Stauffer)
?Phragmodus undatus Branson and Mehl

Remarks: All taxa recovered from this sample are common in both Middle and Upper Ordovician strata, from Rocklandian to Richmondian age. The single specimen tentatively referred to *P. undatus* is a broken phragmodiform element. The fauna is numerically dominated by elements of *P. gracilis*. The sample is of Middle to Upper Ordovician, Rocklandian-Richmondian (middle Caradocian-Ashgillian) age.

Section 6

GSC loc. C-77365; upper member; at base

Drepanoistodus suberectus (Branson and Mehl)
Eobelodina sp.
Panderodus gracilis (Branson and Mehl)
Plectodina sp.

Remarks: The fauna is dominated by the long-ranging species of *Drepanoistodus* and *Panderodus*. A single specimen of *Eobelodina* is similar to that recovered by Barnes (1977, Pl. 4, fig. 13) from the Bad Cache Rapids Formation of Melville Peninsula. The sample is of Middle to Late Ordovician age.

GSC loc. C-77366; upper member; 7.5 m above base

Belodina compressa (Branson and Mehl)
B. dispansa (Glenister)
B. leithi Ethington and Furnish
B. profunda (Branson and Mehl)
Drepanoistodus suberectus (Branson and Mehl)
O. venustus Stauffer s.f.
Panderodus breviusculus Barnes
P. gracilis (Branson and Mehl)
Plectodina tenuis (Branson and Mehl)

Remarks: The diversity of belodinan elements in this sample suggests a Late Ordovician age. The association is typical of Fauna 11 (Sweet et al., 1971), although some taxa may range down into conodont Fauna 10. The sample may range in age from Shermanian to Maysvillian, but it is of late Edenian aspect. This association is present in the upper part of the Thumb Mountain Formation elsewhere in the Arctic Islands (Barnes, 1974; Nowlan, 1976).

GSC loc. C-77369; upper member; top of formation

Belodella? sp.
Drepanoistodus suberectus (Branson and Mehl)
Eoligonodina sp.
Panderodus gracilis (Branson and Mehl)
P. panderi (Glenister)

Remarks: The fauna is numerically dominated by *Panderodus*. A single specimen may be the eoligonodiniform element of *Oulodus ulrichi* (Stone and Furnish). This occurrence and the presence of *P. panderi* suggest a Late Ordovician age.

Section 20

GSC loc. C-77420; lower member; 5.9 m above base

Appalachignathus delicatulus Bergström et al.
Belodella cf. *B. jemtlandica* Löfgren
Distacodus cf. *D. symmetricus* Mound
Drepanoistodus suberectus (Branson and Mehl)
Oulodus? sp.
Panderodus gracilis (Branson and Mehl)
?Phragmodus flexuosus Moskalenko
Scandodus cf. *S. sinuosus* Mound

Remarks: According to Bergström et al. (1974), *A. delicatulus* ranges through Fauna 6 and into the lower part

of Fauna 7 (Sweet et al., 1971). A single representative probably assignable to *P. flexuosus* is present in the sample. This species is typical of Chazyan strata (Faunas 5, 6 of Sweet et al., 1971). The species of *Belodella* is identical to that recovered from the upper part of the Bay Fiord Formation elsewhere in the Arctic Islands (Nowlan, 1976). The age of the sample is upper Chazyan, based upon the occurrence of the species of *Phragmodus* and *Appalachignathus*. This is older than previous age assignments for the Thumb Mountain Formation (Barnes, 1974; Nowlan, 1976).

GSC loc. C-77423; upper member; 0.7 m above base

Eobelodina sp. s.f.
Panderodus gracilis (Branson and Mehl)
P. n. sp.
Phragmodus n. sp. Barnes, 1974
Plectodina tenuis (Branson and Mehl)
?Staufferella sp.

Remarks: The sample has a fauna similar to that of sample C-77086, section 32. The presence of *Plectodina tenuis* in this sample indicates a late Middle Ordovician to Late Ordovician age. As noted for sample C-77086, the range of *Phragmodus* n. sp. Barnes, 1974 is not well known. A complete apparatus can be reconstructed for this taxon from this sample. The forms referred to *Eobelodina* and *Panderodus* n. sp. are the same as those referred to the same genera in sample C-77086. The sample is of late Middle to Upper Ordovician (Shermanian to Richmondian age).

GSC loc. C-77428; upper member; 26.3 m above base

Panderodus gracilis (Branson and Mehl)

Remarks: This taxon ranges from Middle through Upper Ordovician strata and into the Silurian.

GSC loc. C-77431; upper member; top of member

Acodus mutatus Branson and Mehl s.f.
Belodina compressa (Branson and Mehl)
?B. dispansa (Glenister)
B. leithi Ethington and Furnish
Drepanoistodus suberectus (Branson and Mehl)
Oulodus ulrichi (Stone and Furnish)
Panderodus feulneri (Glenister)
P. gracilis (Branson and Mehl)

Remarks: The majority of the taxa recovered from this sample range through the upper part of the Middle Ordovician and through the Upper Ordovician. *O. ulrichi* is, however, known only from strata of Late Ordovician age. Similarly, the rare species *B. leithi* occurs in the Upper Ordovician. The single element tentatively referred to *B. dispansa* is a broad element of the apparatus recently reconstructed by Nowlan and Barnes (1981); none of the typical slender forms were recovered from this sample. Based on the occurrence of *O. ulrichi*, which is known from Faunas 11 and 12 (Sweet et al., 1971), this sample is of late Edenian to Richmondian (latest Caradocian-Ashgillian) age.

GSC loc. C-77083; lower member; 9.0 m above base

Appalachignathus delicatulus Bergström et al.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
Trichonodella sp. s.f.

Remarks: The simple cone taxa (*Drepanoistodus* and *Panderodus*) are both long ranging. *A. delicatulus* ranges through Fauna 6 into the lower part of Fauna 7 of Sweet et al. (1971). It is also known from the North Atlantic Province, where it ranges from the upper part of the *P. serrus* Zone through the base of the *A. tvaerensis* Zone of Bergström (1971). The range is equivalent to Chazyan-early Blackriverian (late Llanvirnian-early Caradocian). The forms assigned to *Trichonodella* are probably part of a *Plectodina* or *Oulodus* apparatus.

GSC loc. C-77086; upper member; basal bed

Drepanoistodus suberectus (Branson and Mehl)
Eobelodina sp. s.f.
Panderodus gracilis (Branson and Mehl)
P. n. sp.
Phragmodus n. sp. Barnes 1974

Remarks: Barnes (1974) reported a new species from the Thumb Mountain Formation of Bathurst Island, which he referred to *Phragmodus*. Several of the elements in this sample can be referred to this new taxon. Its range and distribution is known only from Arctic occurrences. The remainder of the species in the sample either have long or poorly known ranges. An accurate age assessment of the sample cannot be given. The sample is of Middle or Late Ordovician age.

GSC loc. C-77087; upper member; 40.0 m above base

Drepanoistodus suberectus (Branson and Mehl)
Oulodus ulrichi (Stone and Furnish)
Panderodus gracilis (Branson and Mehl)

Remarks: *O. ulrichi* (represented here by its characteristic cyrtoniodiform element) is known from Faunas 11 and 12 of Sweet et al. (1971), and it may range into older strata. It is of Late Ordovician (Edenian-Richmondian) age. The other species in the sample are long ranging.

GSC loc. C-77089; upper member; top of member

Belodina leithi Ethington and Furnish
Drepanoistodus suberectus (Branson and Mehl)
Oulodus ulrichi (Stone and Furnish)
Panderodus gracilis (Branson and Mehl)

Remarks: This sample is of Late Ordovician age (Edenian-Richmondian), based upon the presence of *B. leithi* and *O. ulrichi*. The other two taxa are long ranging.

Correlation

The Thumb Mountain Formation appears to be correlative with the combined thicknesses of the Gonioceras Bay and Troedsson Cliff formations of northwestern

Greenland, on the basis of revised descriptions of the latter formations by Peel and Hurst (1980, p. 21). According to these authors, the Gonioceras Bay "is composed of dark brownish weathering, brown-grey lime mudstones which are mottled, nodular, and massive weathering". The lithology of the overlying Troedsson Cliff is similar to that of the Gonioceras Bay, from which it differs only insofar as it weathers to alternating recessive and resistant units, and fresh surface colours tend to grey rather than to brown. Peel and Hurst (*op. cit.*) suggest a Middle Ordovician (Blackriverian) age for both formations, but this is based on preliminary identifications of megafossils, and it seems possible, therefore, that the Troedsson Cliff may include beds as young as Late Ordovician. Adding support to the correlations suggested here, is the stratigraphic position of combined Gonioceras Bay and Troedsson Cliff formations between the underlying Cape Webster and overlying Cape Calhoun formations that seem to be almost certainly correlative with the Bay Fiord and Irene Bay formations, respectively.

Upper Ordovician

Irene Bay Formation

Definition, distribution and thickness

The Irene Bay Formation, which is made up of argillaceous limestone and shale, represents the upper formation of the Cornwallis Group. The type section of the formation, as established by Kerr (1967a, 1968), is in central Ellesmere Island. The distribution of the formation in the report area (including the archipelago as a whole) is, for all practical purposes, the same as that of the underlying Thumb Mountain Formation. Throughout its area of distribution, the Irene Bay is a relatively thin unit of rock, being seldom greater than 50 m thick. Measured sections of the Irene Bay in the report area range from about 6 to 16.5 m thick, and as such they represent the smallest known thicknesses of the formation (see sections 5, 6, 20, 32 on Figure 10). According to Kerr (1968), the Irene Bay thickens from southeast to northwest across the Franklinian Miogeosyncline on Ellesmere Island. Moreover, as the Irene Bay in the miogeosyncline succession on Cornwallis Island is about 45 m thick and consists mainly of shale, it would appear that the formation thickens considerably to the west in the subsurface of western Devon Island, and that the terrigenous content was probably derived from the Franklinian Eugeosyncline. The formation is recessive and commonly covered by talus or soil. For purposes of mapping it constitutes a particularly important marker, throughout its regional extent, between the resistant Thumb Mountain and overlying Allen Bay Formation (Fig. 50).

The contact between the Irene Bay and Thumb Mountain in the report area is sharply defined, and the uppermost bed of the latter formation is everywhere marked by a limonite-stained hardground. Although this hardground may indicate a hiatus in sedimentation, the similarity in age of conodont faunas collected immediately below and above the contact can leave little doubt that it was of limited duration.

One of the outstanding characteristics of the Irene Bay, as a whole, is its abundant content of fossil material, both as well preserved specimens and especially as fossil debris. It is in this formation that the Arctic Ordovician fauna attains its greatest development in diversity and abundance.

Lithology

The Irene Bay exhibits a twofold subdivision in the report area (Fig. 51). The lower 2 to 3 m of the formation consist of calcareous shale with variable amounts of small, irregular, concretionary masses of limestone. The shale varies from medium light grey to greenish grey. The limestone concretions consist of lime mudstone, and commonly display dark grey coloured fragments of fossils (mainly trilobite remains). The upper part of the formation is made up of limestone that is argillaceous, mainly thin to medium bedded, and medium light grey to medium grey in colour. The limestone is considered to be burrowed skeletal wackestone or lime mudstone (Fig. 52). It commonly contains thin interbeds of shale or shale partings. The bedding is mainly irregular.

Age

The conodont collections from the Irene Bay contain elements of Faunas 11 and 12, indicating that the formation is about Maysvillian-Richmondian (Late Ordovician) in age. The collections are listed below. Identifications and remarks on age were by G.S. Nowlan.

Section 5

GSC loc. C-77438; 4.8 m above base of formation

Belodina inclinata (Branson and Mehl)
cf. *B.* sp. A Sweet, Ethington and Barnes, 1971
Drepanoistodus suberectus (Branson and Mehl)
Panderodus angularis (Branson, Mehl and Branson)
P. feulneri (Glenister)
P. gracilis (Branson and Mehl)
P. n. sp.
Plegagnathus dartoni (Stone and Furnish)

Remarks: *P. dartoni* is typical of Fauna 12 of Sweet et al. (1971) of late Maysvillian-Richmondian age. *B. inclinata* and *P. angularis* are components of both Faunas 11 and 12. The sample is of late Ordovician (Maysvillian-Richmondian) age.

GSC loc. C-77439; 13.3 m above base of formation

Belodina dispansa (Glenister)
Panderodus feulneri (Glenister)
P. gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes
Plectodina? sp.
Walliserodus cf. *W. curvatus* (Branson and Branson)

Remarks: Most of the species recovered from this sample range from Middle to Late Ordovician in age. However, *Panderodus liratus* and *Walliserodus* cf. *W. curvatus* are known only from strata of Late Ordovician (Richmondian) age (Nowlan, in Bolton and Nowlan, 1979; Nowlan and Barnes, 1981). *W.* cf. *W. curvatus* is very similar to Silurian forms of the genus, but is known from strata of Late Ordovician age in North America (see above), from strata of Ashgillian age in the Carnic Alps (Serpagli, 1967) and it may also be present in latest Ordovician strata of Missouri (Thompson and Satterfield, 1975). Only cyrtoniodiform and trichonodelliform elements of a species possibly assignable to *Plectodina* were recovered. The sample is probably of Late Ordovician (Richmondian) age.

Figure 51. *Outcrops of the Thumb Mountain (OCT), Irene Bay (OCI) and Allen Bay (OSA) formations on the north coast of Devon Island, about 1 km southwest of Boat Point (Station 59, Bear Bay West). Note the sharply defined character of the lower and upper contacts of the Irene Bay Formation. At this locality, the Irene Bay is about 6 m thick, and formed of greenish grey shale, replete with small irregular nodules of limestone, interbedded with limestone. Overlying the Irene Bay are three units of rock (OSA1 to OSA3) that comprise the lower member of the Allen Bay Formation in the report area. OSA1 is mottled limestone and about 7 m thick. It is lithologically similar to OSA3 and to the upper part of the Thumb Mountain Formation. Overlying OSA1 are about 2 m of greenish grey shale and limestone that are, for all practical purposes, a repetition of Irene Bay - type lithologies. OSA3 is about 100 m thick. It is of interest to note that this threefold lithologic subdivision of OSA1, OSA2 and OSA3 is known to characterize the lower part of the Allen Bay Formation – with minor variations in thickness and lithology – throughout western parts of Devon Island, Cornwallis Island and southwestern Ellesmere Island.*

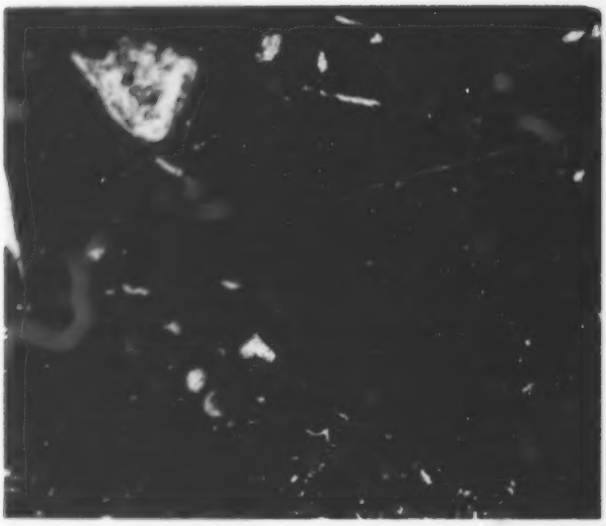

Figure 52. *Photomicrograph of limestone from the upper part of the Irene Bay Formation. This is a burrowed skeletal wackestone (C-77434, section 20, Fig. 10; composite stratigraphic section E, unit 108.)*

Section 6

GSC loc. C-77371; 3.9 m above base of formation

Panderodus gracilis (Branson and Mehl)
Trichonodella sp.

Remarks: This restricted fauna suggests a Middle to Late Ordovician age. The fragment of *Trichonodella* sp. is not identifiable at the specific level.

Section 20

GSC loc. C-77432; 3.1 m above base of formation

Aphelognathus sp.
Belodina compressa (Branson and Mehl)
B. inclinata (Glenister)
B. profunda (Branson and Mehl)
B. sp. A Sweet, Ethington and Barnes, 1971
cf. *B.* sp. A Sweet et al., 1971
Drepanoistodus suberectus (Branson and Mehl)
Oulodus ulrichi (Stone and Furnish)
Panderodus angularis (Branson, Mehl and Branson)
P. breviusculus Barnes
P. feulneri (Glenister)
P. gracilis (Branson and Mehl)
P. n. sp.

Remarks: The panderodan-belodinan domination of this fauna is typical of the Irene Bay Formation (Barnes, 1974; Nowlan, 1976). This proliferation of species of *Belodina* is typical of Fauna 11 (Sweet et al., 1971) and they range upwards into Fauna 12. The forms referred to and compared with *Belodina* sp. A of Sweet et al., 1971 probably represent two species of a new genus. The lack of typical representatives of Fauna 12 [e.g. *Amorphognathus ordovicicus* Branson and Mehl and *Plegagnathus dartoni* (Stone and Furnish)] implies that this sample is equivalent to Fauna 11. Thus, the sample is of late Edenian to Richmondian age, but most probably is restricted to the late Edenian-early Maysvillian (late Caradocian-early Ashgillian).

Section 32

GSC loc. C-77090; 2.9-4.1 m above base of formation

Belodina compressa (Branson and Mehl)
B. leithi Ethington and Furnish
Cordylodus sp.
Cyrtoniodus sp.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus feulneri (Glenister)
P. gibber Nowlan and Barnes
P. gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes
Walliserodus cf. *W. curvatus* (Branson and Mehl)

Remarks: This fauna, which is dominated by panderodan and belodinan species, is typical of the Irene Bay Formation elsewhere in the Arctic Islands (Barnes, 1974; Nowlan, 1976). Most are long ranging, but *B. leithi* is known only from Upper Ordovician strata. The presence of *Walliserodus* cf. *W. curvatus* is believed to indicate a late Ordovician age, based on its occurrence in other places (see discussion under sample C-77439). *P. liratus* and *P. gibber* are both known from Late Ordovician strata on Anticosti Island (Nowlan and Barnes, 1981) and the latter ranges into the Silurian (McCracken and Barnes, 1981). The sample is of probable Richmondian (Late Ordovician) age.

Correlation

There can be little doubt that the Irene Bay Formation is correlative with the Cape Calhoun Formation of northwestern Greenland, which Peel and Hurst (1980, p. 23) have described as follows: "This characteristically greenish weathering interval between the more prominent Troedsson Cliff and Aleqatsiaq Fjord Formations is a conspicuous mapping horizon in western North Greenland. Pale grey or greenish grey, nodular lime mudstones with green shaly partings predominate. Decrease in the shale components produces benches of more resistant lime mudstone and wackestone near the middle and top of the formation". Moreover, according to these authors, "A general late Ordovician age is indicated".

Upper Ordovician to Upper Silurian

Allen Bay Formation

Definition and distribution

Allen Bay Formation is the name given by Thorsteinsson and Fortier (1954) to a body of rock consisting mainly of dolomite in southern Cornwallis Island. It was described more fully by Thorsteinsson in 1958. The Allen Bay conformably overlies the Irene Bay Formation. The upper boundary of the Allen Bay, as originally defined, was revised stratigraphically downwards by Kerr (1975), who, on the basis of studies in southwestern Ellesmere Island, established that the Cape Storm Formation is composed mainly of beds that had been thought to comprise the upper part of the Allen Bay Formation but, in some places, includes beds that had been considered as belonging to the lower part of the Douro Formation or, in other places, the lower part of the Read Bay Formation. Besides Cornwallis and Ellesmere islands, the Allen Bay Formation outcrops on Grinnell Peninsula (Morrow and Kerr, 1977), Somerset Island and Boothia Peninsula (Miall and Kerr, 1980), and Prince of Wales Island (Thorsteinsson and Uyeno, 1981). On Devon Island, the Allen Bay mainly occurs as a northerly-trending, broad belt of exposures that extends from Lancaster Sound to Jones Sound across central parts of the *Maxwell Bay* and *Bear Bay West* map areas. Smaller areas of Allen Bay outcrops are preserved in the half-grabens between Croker Bay and Dundas Harbour (*Dundas Harbour*), the half-graben at Burnett Inlet (*Powell Inlet*), and in the environs of Viks Fiord, in northwestern *Bear Bay West*. As in other parts of the archipelago, the Allen Bay on Devon Island is generally resistant and topographically prominent.

Lithology and thickness

Eleven measured sections (5, 6, 20, 32, 34-38, 53, 54) of the Allen Bay Formation are shown on Figure 10. No single section embraces a complete thickness of the formation. Nevertheless, a composite of five overlapping sections (34-38) measured along the south coast of the island (*Maxwell Bay*) indicates a total thickness of 660 m for the formation. Little information is available on regional variations in the thickness of the Allen Bay on Devon Island because a full thickness of the formation is present only in westernmost exposures. However, it is of interest to note that the Allen Bay ranges from about 1200 to 1375 m thick on neighboring Cornwallis Island, indicating that the formation probably thickens significantly from east to west across Devon Island.

A tripartite subdivision of Allen Bay rocks is apparent in the report area. The formation includes a particularly distinctive lower member consisting mainly of limestone; and middle and upper members, both of which are composed largely of dolomite. The lithological characterization of the formation that follows is based largely on sections 34 to 38.

The lower member ranges in thickness from about 93 m in the east (section 5) to a maximum of 144.3 m in the west (section 34). The lithology of this member is strikingly similar to that of the upper member of the Thumb Mountain Formation, and consists mainly of a uniform succession of limestone that varies from medium grey to brownish grey,

and is ordinarily medium bedded to massive. The limestone is lime mudstone and skeletal-intraclast wackestone (Fig. 53). Layers of packstone in the medium calcarenite size-range are common. The skeletal fragments are varied, and include crinoidal debris and fragments of dasycladaceans and ostracodes. Sponge spicules are abundant. The limestone is ordinarily dolomitic with the dolomite usually following a labyrinthine pattern. The lower part of the member is slightly argillaceous, and at several localities a 1 to 2 m thick interval of argillaceous limestone with interbeds of greenish grey shale and limestone nodules, which are similar to the Irene Bay Formation, occurs 6 to 7 m above the base of the member (see Figure 51; also section G, unit 3 in Appendix). Megafossils, including tabular stromatoporoids, corals and the gastropod *Maclurites* sp., are sparsely distributed throughout this member.

The middle member is 301.5 m thick, as determined from sections 35 to 37. It is composed of two principal interbedded lithofacies: light coloured, thin to medium bedded dolomite, and dark coloured, massive dolomite. A similar lithological differentiation of the Allen Bay in the Prince Alfred Bay region of northwestern Devon Island has been described by Morrow and Kerr (1977).

The light coloured lithofacies tends to be recessive and poorly exposed. It consists mainly of dolomite that is finely to medium crystalline, hypidiotopic, and commonly laminated. The laminae are generally wavy, and mostly of algal origin; beds with laterally linked, hemispherical stromatolites are common. The dominant fresh surface and weathering colours are light shades of grey, yellow and brown. Desiccation and synaeresis cracks were not observed in the field, but in thin section some laminae are cracked and offset (Fig. 54). Synsedimentary dolomite forms laminae in rare interbeds of lime mudstone. Patterned carbonate (Dixon, 1976) and intraformational conglomerate, though rare, are present also in this lithofacies. Several units of solution breccia are also present, the clasts of which are pebbles and boulders of the dark coloured lithofacies, described below. Several units of anhydrite are evident in this member in the Devon Island well (see section 54), and it seems reasonable to interpret the units of breccia, noted above, as having formed by near-surface solution of anhydrite. This lithofacies is apparently devoid of megafossils.

The dark coloured lithofacies is made up of pale brown to greyish brown dolomite. The dolomite is mostly massive, but lower parts of this lithofacies may be thin to medium bedded, partly calcareous, and gradational into dolomitic limestone. The dolomite is medium crystalline, hypidiotopic, and exhibits intercrystalline porosity. Much of the original texture is destroyed, but where recognizable, it resembles that of an intraclast-skeletal grainstone or packstone. The lithofacies is replete with megafossils; an abundance of brachiopods, spherical stromatoporoids and corals. *Favosites* sp. is evident in the lower parts of units, whereas the upper parts are generally characterized by tabular stromatoporoids and *Halysites* sp., with the latter commonly forming small bioherms (Fig. 55).

The contacts between the light and dark coloured lithofacies are commonly gradational, and there is reason to believe that they are, in part, facies equivalents of one another. Individual units of dark coloured dolomite range up to 40 m and more in thickness, and although one, or possibly two units appear to persist throughout the entire length of the Allen Bay Formation that strikes northerly across

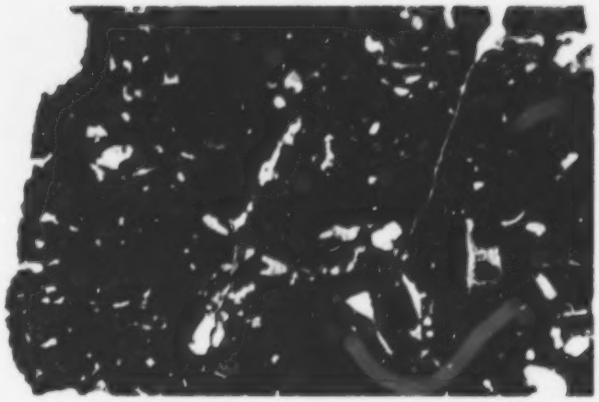

Figure 53. *Photomicrograph of limestone from the lower member of the Allen Bay Formation. The rock is a burrowed skeletal wackestone. Clasts include fragments of crinoids, dasycladaceans, ostracodes and sponge spicules. Dolomitic mottling is present in the upper part of the section. (C-77243, section 34, Fig. 10; composite stratigraphic section G, unit 2.)*

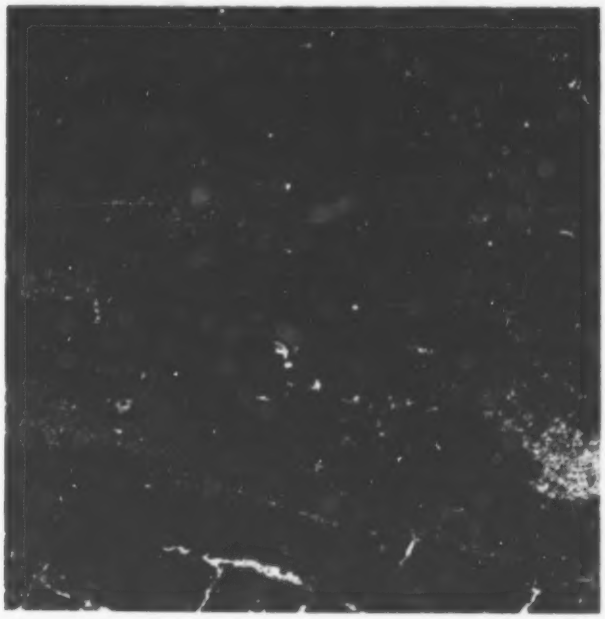

Figure 54. *Photomicrograph of limestone from laminated lithofacies in the middle member of the Allen Bay Formation. Two types of lamination are exhibited here. Dark laminae with shrinkage cracks in the lower part of the section are clotted, and possibly of algal origin. The upper surfaces of the dark laminae are erosional surfaces, above which are crossbedded laminae of sedimentary origin. Light coloured zones consist mainly of finely crystalline dolomite euhedrons. (C-77104, section 36, Fig. 10; composite stratigraphic section G, unit 21.)*

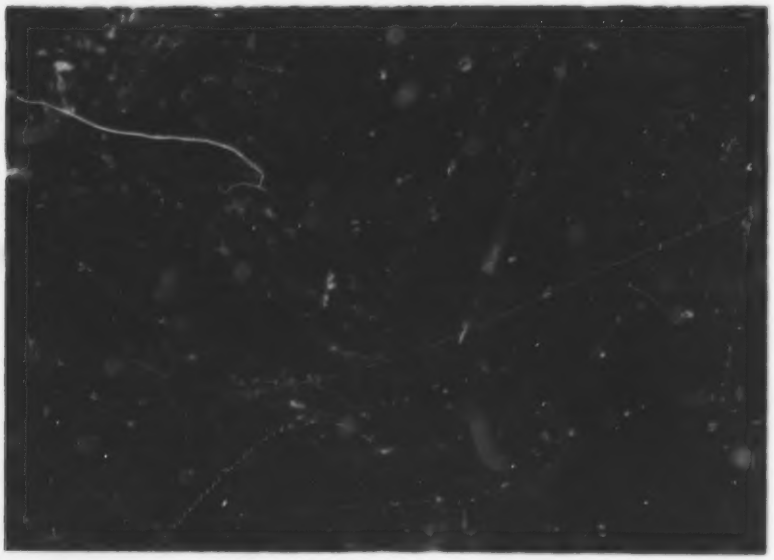

Figure 55. *Bioherm in the middle member of the Allen Bay Formation east of the entrance to Rigby Bay on the south coast of Devon Island (**Maxwell Bay**) where section 36 (Fig. 10) was studied. The middle member is commonly biostromal (see Fig. 56), and also contains small bioherms of large **Halysites** sp. heads (shown here) and stromatoporoids.*

Maxwell Bay, and *Bear Bay West*, others are clearly discontinuous. These units of rock stand out prominently in the landscape as dark coloured castellated ledges and craggy pinnacles (Fig. 56).

Not included in either lithofacies is a unit of very dark grey grainstone, 2 m thick, at the base of the member on the south coast of Devon Island. This unit will be discussed later.

The upper member of the Allen Bay is 220.5 m thick in section 38. It lies with a sharp conformable contact on the middle member and consists of a varied assemblage of carbonate rocks, in which two interbedded lithofacies predominate. The first of these comprises detrital dolomite that is light brown and laminated. The detrital grains are finely crystalline, silt-size and commonly poorly sorted. In some instances, micrite pellets are mixed in with the dolomite grains. The lamination is mostly planar and less commonly wavy; one thin section exhibits crosslamination.

The second lithofacies consists of limestone and dolomite that are moderate brown to greyish brown and thin to thick bedded. Limestone predominates in the lower part of the member, whereas dolomite is more common in the upper part. Some mottled lime mudstone and skeletal wackestone are present in the middle part of the member, but most of the limestone has grainstone texture (Fig. 57) and attains the grain size of calcirudite. The clasts are mudlumps, composite grains and minor skeletal fragments. Coated grains are rare. The dolomite is medium crystalline, hypidiotopic, porous, and appears to have been originally a grainstone. The texture is virtually obliterated by dolomitization, but a vague grainstone texture is apparent in one thin section.

In contrast to the middle member of the formation in which the two dominant lithofacies are represented by a few thick intervals, the lithofacies of the upper unit occur as numerous, interbedded, thin units. Moreover, in the lower part of the upper member, the lithofacies form distinct couplets in which medium bedded grainstone lies with sharp contact on laminate dolomite and grades upward into laminated dolomite. In addition to the foregoing rock types, the member contains two intervals of solution collapse breccia, characterized by an assemblage of heterogeneous fragments, and a unit of patterned carbonate.

The member exhibits very few megafossils. Stromatoporoids and cephalopods were observed in one interval only (see section 38). Stromatolites are present in both lithofacies. Skeletal remains and trace fossils are restricted to the thicker bedded carbonate rocks.

Age

The conodont faunas obtained from the Allen Bay Formation are listed below. Identifications and age determinations of the Ordovician faunas were by G.S. Nowlan, whereas those of Silurian faunas, with one exception, were by T.T. Uyeno; the Silurian fauna in sample C-79481 was identified by G.S. Nowlan.

Section 20

Lower member

GSC loc. C-77437; base of member

Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
Plectodina tenuis (Branson and Mehl)
Walliserodus cf. ***W. curvatus*** (Branson and Mehl)

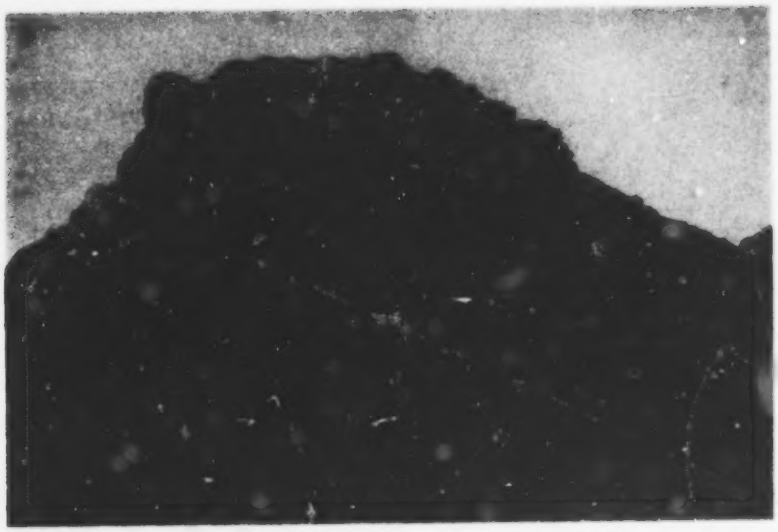

Figure 56. *Outcrop of the middle member of the Allen Bay Formation south of Haughton Astrobleme (Station 60,* ***Bear Bay West****). This is a typical castellated outcrop of the massive, dark coloured, biostromal dolomite that comprises one of the two dominant lithofacies in the middle member.*

Remarks: *P. gracilis* and *D. suberectus* are common components of faunas ranging in age from Middle through Late Ordovician. *P. tenuis* (formerly part of *P. furcata*) ranges from Kirkfieldian through Richmondian in age (Sweet et al., 1971, Faunas 9-12). It is believed that the presence of *W.* cf. *W. curvatus* indicates a Late Ordovician age (see discussion of sample C-77439, under Irene Bay Formation). Thus, the sample may range from Kirkfieldian to Richmondian (middle Caradocian to Ashgillian), but is probably of late Ordovician (?Richmondian) age.

Section 32

Lower member

GSC loc. C-77092; base of member

Acodus mutatus Branson and Mehl s.f.
Belodina compressa (Branson and Mehl)
B. dispansa (Glenister)
Cyrtoniodus sp. s.f.
Distacodus procerus Ethington s.f.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gibber Nowlan and Barnes
P. gracilis Branson and Mehl
P. liratus Nowlan and Barnes

Remarks: The majority of taxa recovered from this sample are known to have long stratigraphic ranges through the Middle and Upper Ordovician. *Panderodus liratus* and *P. gibber* very probably indicate a Late Ordovician age, though the latter species is known to range into the Silurian (McCracken and Barnes, 1981). Although the stratigraphic range of these forms has not been established, they are almost certainly restricted to the Upper Ordovician. The element assigned to *Cyrtoniodus* sp. s.f. is probably part of a *Plectodina* apparatus, but the absence of other constituent elements precludes specific identification. The sample is, therefore, probably of Late Ordovician age.

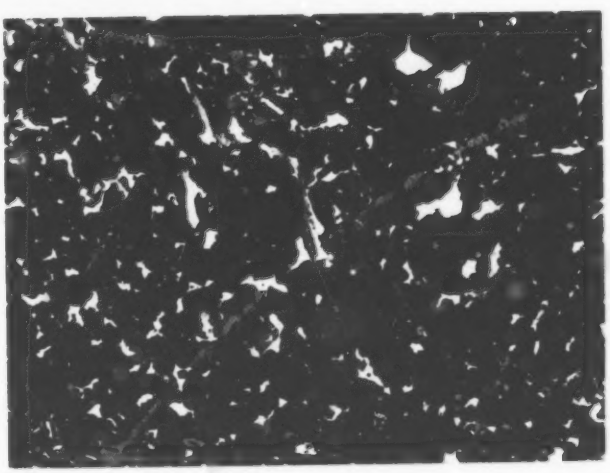

Figure 57. *Photomicrograph of limestone from the medium to thick bedded lithofacies in the upper member of Allen Bay Formation. This is a grainstone, consisting of composite grains and minor amounts of skeletal fragments with calcite cement. The limestone exhibits intergranular porosity. Grain size is that of fine to medium calcirudite. (C-77151, section 38, Fig. 10; composite stratigraphic section G, unit 74.)*

Section 34

Lower member

GSC loc. C-77242; base of member

Belodina inclinata (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes

Remarks: This sparse fauna comprised of simple cones is indicative of Late Ordovician age. *B. inclinata* ranges from Edenian to Richmondian (Sweet et al., 1971). *P. liratus* was described by Nowlan and Barnes (1981) from the Richmondian Vauréal Formation of Anticosti Island. The stratigraphic range of this new taxon is not well known. The sample is of Late Ordovician, Edenian to Richmondian (late Cardocian-Ashgillian) age.

GSC loc. C-77247; 135 m above base

Distacodus procerus Ethington s.f.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
P. panderi (Glenister)
P. liratus Nowlan and Barnes

Remarks: Most of the taxa are long ranging through Middle and Upper Ordovician strata. The presence of *D. procerus* and *P. panderi*, however, suggests a Late Ordovician age. *P. liratus* was described by Nowlan and Barnes (1981) from the Vauréal Formation of Anticosti Island, which is of Richmondian age. The sample is of Late Ordovician age.

Section 61

Lower member

A section of the lower member of the Allen Bay that occurs about 2 km south of the Haughton crater (*Bear Bay West*) was sampled for conodonts by collecting about 2 kg of rock at 3 m intervals. At this station (see *Bear Bay West*), the lower member is represented by 102 m of completely exposed beds extending from the top of the Irene Bay Formation up to a 12.5 m covered interval that marks the contact with the overlying middle member of the Allen Bay. Out of a total of 34 samples, 15 yielded conodonts. The collections, as identified by G.S. Nowlan, are as follows:

GSC loc. C-79465; base of member

Belodina dispansa (Glenister)
"Cordylodus" robustus Stone and Furnish s.f.
Oulodus? sp.
Panderodus gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes

GSC loc. C-79466; 9 m above base

"Oistodus" venustus Stauffer s.f.
Panderodus gracilis (Branson and Mehl)

GSC loc. C-79467; 12 m above base

Drepanoistodus sp. (hyaline)
Panderodus gracilis (Branson and Mehl)

GSC loc. C-79468; 15 m above base

Panderodus gracilis (Branson and Mehl)
Paroistodus? mutatus (Branson and Mehl)

GSC loc. C-79469; 18 m above base

Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)

GSC loc. C-79480; 21 m above base

Amorphognathus sp. (ambalodiform elements)
Belodina inclinata (Branson and Mehl)
B. profunda (Branson and Mehl)
Drepanoistodus suberectus (Branson and Mehl)
"Oistodus" venustus Stauffer s.f.
Panderodus feulneri (Glenister)
P. gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes
Plegagnathus dartoni (Stone and Furnish)

GSC loc. C-79470; 24 m above base

Belodina inclinata
"Drepanodus" sp. s.f.
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes

GSC loc. C-79471; 27 m above base

Belodina cf. *B. dispansa* (Glenister)
Panderodus gracilis (Branson and Mehl)

GSC loc. C-79472; 33 m above base

The sample yielded only a fragment of a species of the genus *Panderodus* Ethington

GSC loc. C-79473; 36 m above base

Amorphognathus ordovicicus Branson and Mehl
Drepanoistodus suberectus (Branson and Mehl)
Panderodus feulneri (Glenister)
P. gracilis (Branson and Mehl)
P. liratus Nowlan and Barnes
Paroistodus? mutatus (Branson and Mehl)
Plegagnathus dartoni (Stone and Furnish)

GSC loc. C-79474; 39 m above base

The sample yielded a single specimen referable to the form genus *Cyrtoniodus*

GSC loc. C-79475; 42 m above base

Only two specimens recovered

Panderodus gracilis (Branson and Mehl)
P. gibber Nowlan and Barnes

GSC loc. C-79476; 48 m above base

The sample yielded only four poorly preserved specimens which are pitted and abraded

Drepanoistodus sp.
Panderodus sp.

GSC loc. C-79477; 57 m above base

Panderodus gracilis (Branson and Mehl)

GSC loc. C-79478; 99 m above base

Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)

Concerning the above faunas, Nowlan comments as follows:

"The basal sample of the Allen Bay Formation in this section is clearly of Late Ordovician age". It is probably Richmondian based on the presence of *"Cordylodus" robustus* and *P. liratus*. The former taxon is probably part of the apparatus including *Plegagnathus dartoni*, a characteristic component of Fauna 12 (Sweet et al., 1971) and the latter is common in strata of Richmondian age on Anticosti Island (Nowlan and Barnes, 1981).

Succeeding samples to the level 18 m above base do not contain diagnostic faunal elements, being composed almost entirely of long-ranging species of *Panderodus* and *Drepanoistodus*.

Sample C-79480 at the 21 m level contains a fauna characteristic of Fauna 12 (Sweet et al., 1971), including the key taxa *Amorphognathus ordovicicus*, *Belodina profunda* and *Plegagnathus dartoni*. This sample is of Late Ordovician, Richmondian age. A similar fauna is present in sample C-79473, 36 m above the base of the formation.

Sample C-79474 contains only an element assignable to *Cyrtoniodus* s.f. This specimen may be part of an *Oulodus* apparatus and is of Ordovician rather than Silurian aspect. Succeeding samples from 42 m to 99 m above base do not contain diagnostic conodonts. The bulk of the fauna is long ranging from Middle or Upper Ordovician through Silurian. However, *D. suberectus* is not known to range above the Ordovician, and therefore the 99 m level (C-79478) is presumably Late Ordovician in age. The uppermost sample, 130.5 m above base (C-79479), is unfortunately barren.

In summary, the basal 36 m of the Allen Bay Formation in this section is of undoubted Late Ordovician age. The remainder of the section is presumed to be also Late Ordovician.

Section 5

Middle member

GSC loc. C-77215; 39 m above base

Ozarkodina manitoulinensis (Pollock, Rexroad and Nicoll)
Panderodus sp.
Oulodus sp.

Remarks: The fauna is middle Llandoverian in age (Early Silurian); late Idwian to late Fronian (*kentuckyensis* Zone).

GSC loc. C-77217; 79 m above base

Ozarkodina sp. cf. *O. hassi* (Pollock, Rexroad and Nicoll)
Panderodus sp.

Remarks: The fauna is probably middle Llandoverian in age (Early Silurian). *O. hassi* ranges from late Idwian to early Telychian (*kentuckyensis* Zone).

Section 35

Middle member

GSC loc. C-79481; 0-2 m above base

Distomodus sp. (ramiform element)
Icriodina? sp. (a single fragment)
Ozarkodina manitoulinensis (Pollock, Rexroad and Nicoll)
Walliserodus curvatus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)

Remarks: The specimens assigned to *Distomodus* and *Icriodina*? are fragmentary and specific identification is not possible. *P. gracilis* and *W. curvatus* are long-ranging, simple cone taxa. Only *O. manitoulinensis* affords biostratigraphic value. It is known from the Manitoulin Dolomite of Ontario (Pollock, Rexroad and Nicoll, 1970) and from the Brandon Ridge Member of the Joliet Formation in Illinois (Liebe and Rexroad, 1977). Both of these occurrences are of Early Silurian (Llandoverian) age. This scanty information suggests that the sample is of Llandoverian age.

Section 38

Upper member

GSC loc. C-77120; 43 m above base

Ozarkodina excavata excavata (Branson and Mehl)
O. confluens? (Branson and Mehl)

Remarks: *Ozarkodina confluens* is represented by small, fragmentary specimens and their assignment is questionable. *O. excavata excavata* ranges from the Ludlovian to Early Devonian.

Station 75

Maxwell Bay

GSC loc. C-79402; 10 m below top of upper member

Oulodus sp.
Ozarkodina n. sp. B of Mirza (1976)
Panderodus simplex (Branson and Mehl)
Pygodiform element

GSC loc. C-79401; 1 m below top of upper member

Kockelella variabilis Walliser
Ozarkodina n. sp. B of Mirza (1976)
Panderodus sp.

Remarks: In the Cellon section of the Carmic Alps, *Kockelella variabilis* starts either in the uppermost part of the *sagitta* Zone (Barrick and Klapper, 1976, p. 67) or in the *crassa* Zone (Walliser, 1964, Table 2, part 2), and continues on to the *silurícus* Zone. That C-79401 and C-79402 are no older than the *crassa* Zone is suggested by the occurrence of *Ozarkodina excavata* in C-77120 which has its unequivocal lower age range in that zone. The possible age range of C-79401 and C-79402 is thus the *crassa* to *silurícus* zones. The *crassa* Zone has not been found with zonal graptolites so that its precise age is uncertain. Barrick and Klapper (1976, p. 68) have noted that the zone could conceivable range from late Wenlockian to early Ludlovian.

To sum up, the conodont evidence indicates that the age span of the Allan Bay Formation in the report area is about Richmondian (conodont fauna 12; Late Ordovician) to late Wenlockian (*crassa* Zone) or Ludlovian (*silurícus* Zone). But, with regards to the uppermost age limit of the Allen Bay, it is of interest to note that the formation on Griffith Island, a small island of the south coast of neighboring Cornwallis island, has yielded conodonts of the *silurícus* Zone 9.1 m below the upper contact of the formation (Thorsteinsson and Uyeno, 1980). It therefore seems reasonable to assume that the collections C-79401 and C-79402 dated above by Uyeno as Wenlockian or Ludlovian are more probably Ludlovian than Wenlockian.

Contact between the lower and middle members

The evidence of the conodont age determinations indicates that the contact between the lower and middle members of the Allen Bay Formation corresponds to the boundary between the Ordovician and Silurian systems. Consequently, in view of the fact that these members are composed of contrasting lithologies, question arises as to whether the contact represents an unconformity. Actual exposure of the contact between the members was observed only in the cliffs east of Cape Hurd on the south coast of Devon Island (*Maxwell Bay*), and it is in this region that there is physical and faunal evidence, however tenuous, that the contact may represent an unconformity. In this connection, two measured sections merit special notice.

In section 35, which was measured about 6 km east of Cape Hurd, the base of the middle member is represented by a distinctive unit that does not belong to either of the two principal lithofacies noted in an earlier discussion of that member (see section G, units 7 to 9, in Appendix). This particular unit is 2 m thick and consists of very dark grey, argillaceous dolomite that is very finely crystalline and thin bedded. The lower and upper contacts are sharply defined. The unit yields a conodont fauna (C-79481) that includes *Ozarkodina manitoulinensis* and is dated as middle Llandoverian; and more precisely as late Idwian to late Fronian. The lower member at section 35 consists of medium bedded to massive mottled limestone, which, as noted earlier is typical of most of this member in the report area. The top of this member is hardground. Samples of rock, totalling about 20 kg, were collected from the upper 10 m of the lower member for conodont analysis, but none was obtained. This was not entirely unexpected because the upper half or more of the lower member is commonly poor in conodonts.

Section 34 was measured about 3 km east of section 35, and there the same unit of very dark grey, argillaceous dolomite, also 2 m thick, marks the base of the middle member. Immediately underlying the base of the middle member and representing the uppermost part of the lower member are two distinctive rock units that have not been observed elsewhere in this member. The uppermost unit is limestone, 1.5 m thick, that is brownish grey, thin to medium bedded and composed of pelletoidal grains. The penultimate unit is dolomitic limestone 6.3 m thick that is slightly argillaceous, very dark grey, and thin to medium bedded. In addition, it contains thin interbeds of dolomite and nodules of chert. A covered interval of 1.5 m separates this unit from the underlying main body of the lower member that is made up mainly of medium bedded to massive, mottled limestone. At the top of this main body, a Late Ordovician age is indicated by the presence of conodonts (C-77247). The presence in section 34 of the two uppermost units of the lower member described above, and their absence in section 35, suggest that they are either facies equivalents of the mottled limestone at the top of the latter section, or that they have been bevelled out by erosion, prior to deposition of the middle member. The apparent absence of faunal evidence for earliest Llandoverian (Ruddanian) or of Zone 13 (Gamachian, latest Ordovician) in either member would seem to favour the second possibility. In any case, the question of whether the contact of the members is an unconformity is unresolved. One fact, however, seems apparent: the gap in the conodont record, if real, is small and would seem to indicate only a rather minor interruption in the sedimentary record.

Correlation

The Alequatsiaq Fjord Formation of northwestern Greenland appears to be correlative with the lower member of the Allen Bay Formation on the basis of its lithology, age and stratigraphic position above the Cape Calhoun Formation. The Alequatsiaq Fjord Formation was erected by Peel and Hurst (1980, p. 23) and described briefly as consisting mainly of lime mudstone and wackestone which weathers to a nodular, dark grey-brown and mottled yellowish appearance. The upper parts of the formation are in many places chertified and contain thin shale films. Pervasive dolomitization occurs throughout. The age of the Alequatsiaq Fjord is Late Ordovician to Early Silurian (Llandoverian), and it is probable, therefore, that it also includes beds that are correlative with the middle member of the Allen Bay Formation on Devon Island.

Upper Silurian

Cape Storm Formation

Definition and distribution

The formation was named by Kerr in 1975 for exposures in southwestern Ellesmere Island. The type section is 196.6 m thick and divisible into two members (Kerr, *op. cit.*): a lower member consisting mainly of medium to thick bedded dolomite (48.8 m thick) and an upper member composed mainly of thin to medium bedded dolomite and lesser amounts of limestone (147.8 m thick). The Cape Storm is now known to be widely distributed in the archipelago. It occurs in Grinnell Peninsula (Morrow and Kerr, 1977), Cornwallis Island (Thorsteinsson in Thorsteinsson and Uyeno,

1981), Somerset Island and Boothia Peninsula (Miall and Kerr, 1977), and Prince of Wales Island (Thorsteinsson in Thorsteinsson and Uyeno, 1981). On Devon Island, the principal exposures of the formation trace a northerly path from Radstock Bay on the south coast (*Maxwell Bay*) to Viks Fiord on the north coast (*Bear Bay West*).

According to Kerr (1975), the lower member of the Cape Storm in Ellesmere Island ranges from Llandoverian to Ludlovian in age whereas the upper member is Ludlovian in age. It is of interest to note, therefore, that all other occurrences of the formation, including those on Devon Island, are apparently of Ludlovian age only (Thorsteinsson and Uyeno, 1981). In view of the foregoing, future studies of the Cape Storm on Ellesmere Island may well indicate the desirability of excluding Kerr's lower member of the Cape Storm from that formation and including it in the underlying Allen Bay Formation.

Throughout most of its areal extent, the Cape Storm conformably overlies the Allen Bay Formation, but in a limited region of Grinnell Peninsula the Cape Storm-Allen Bay Formation contact is an angular unconformity (Kerr, 1977), and in northeast Somerset Island the Cape Storm overlies a varied assemblage of evaporitic rocks that Miall and Kerr (1977) refer to the Cape Crauford Formation.

In most parts of the archipelago the contact between the Cape Storm and Allen Bay is gradational (Thorsteinsson in Thorsteinsson and Uyeno, 1981). On Devon Island, however, the contact is sharply defined (Fig. 58), and drawn where the dominantly medium to thick bedded dolomite of the Allen Bay gives place upward to mainly very thin to thin bedded dolomite of the Cape Storm. Other criteria useful in differentiating these formations are as follows: the Allen Bay is more resistant to erosion and produces a rather rugged landscape, whereas the Cape Storm tends to weather to smoothly rounded slopes (Fig. 61). Uplands developed on Cape Storm outcrops present a finely banded appearance – particularly as viewed from a distance or on aerial photographs – that contrasts markedly with those of the Allen Bay Formation.

Lithology and thickness

No full section of the Cape Storm was studied in detail during the course of field investigations described in the present account. The upper part of the formation, however, was measured at Radstock Bay (*Maxwell Bay*) on the south coast of the island (see section 39, Fig. 11), and the entire formation was examined cursorily in superb exposures on the north coast (*Bear Bay West*; see figures 59, 60). In addition, a complete thickness of the Cape Storm was penetrated in the Imperial IOE Panarctic et al. Devon E-45 well in *Maxwell Bay* area (Mayr, 1978), where the formation is 431.6 m thick (interval 938.8-1370.4 m; see section 54, Fig. 11).

Lower and upper divisions of the Cape Storm are evident in the report area. The lower, and greater part of the formation is made up of very thin to thin bedded dolomite that is mainly detrital and in the coarse silt-sized range. It is predominantly medium grey in colour and calcareous, and contains a good proportion of micrite pellets. In addition, it is commonly silty and contains quartz, various detrital feldspars, and mica (Fig. 62). The upper 100 m or so of the formation are mainly limestone (see section 39). The most common variety of limestone is intraclast-skeletal grainstone of mud-lumps and composite grains, some of which appear to have algal coatings. Nodular, argillaceous limestone is present also and commonly occurs in thick beds.

The dominant weathering colours of the dolomite, particularly as observed on upland surfaces, are varying hues of grey, yellow and especially brown, whereas the limestone tends to weather to light shades of grey and greenish grey.

The dolomite is notably barren of megafossils. The limestone is, however, moderately fossiliferous, the most common fossils being corals, stromatoporoids, brachiopods, gastropods and ostracodes.

Age

The upper part of the Cape Storm Formation, which is shown as section 39 on Figure 11, has yielded the following conodont faunas:

GSC loc. C-77097; 28.1-30.2 m above base of section

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) gamma morphotype of Klapper and Murphy (1975)

GSC loc. C-77098; 49.6-51.9 m above base of section

Ozarkodina confluens (Branson and Mehl) gamma morphotype of Klapper and Murphy (1975)
cf. Apparatus B in Uyeno (1981)

GSC loc. C-77099; 53.2-58.7 m above base of section

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) gamma morphotype of Klapper and Murphy (1975)
cf. *Polygnathoides*? sp. A in Uyeno (1981)

GSC loc. C-77100; 61.1-63.4 m above base of section

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) gamma morphotype of Klapper and Murphy (1975)
cf. *Polygnathoides*? sp. A in Uyeno (1981)

GSC loc. C-77452; 63.4 m above base of section

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) morphotype indeterminate (3 small Pa elements)
Apparatus B in Uyeno (1981)

The identifications of the above faunas were by T.T. Uyeno who stated that *Ozarkodina douroensis* suggests the *silurícus* Zone of Ludlovian age and, furthermore, that this species has been found previously in the Douro Formation on Cornwallis and Prince of Wales islands and Boothia Peninsula (Uyeno in Thorsteinsson and Uyeno, 1981). That the Cape Storm Formation is probably entirely Ludlovian in age is indicated by the suggested Ludlovian age of the uppermost part of the underlying Allen Bay Formation and the firmly established Ludlovian age of the overlying Douro Formation.

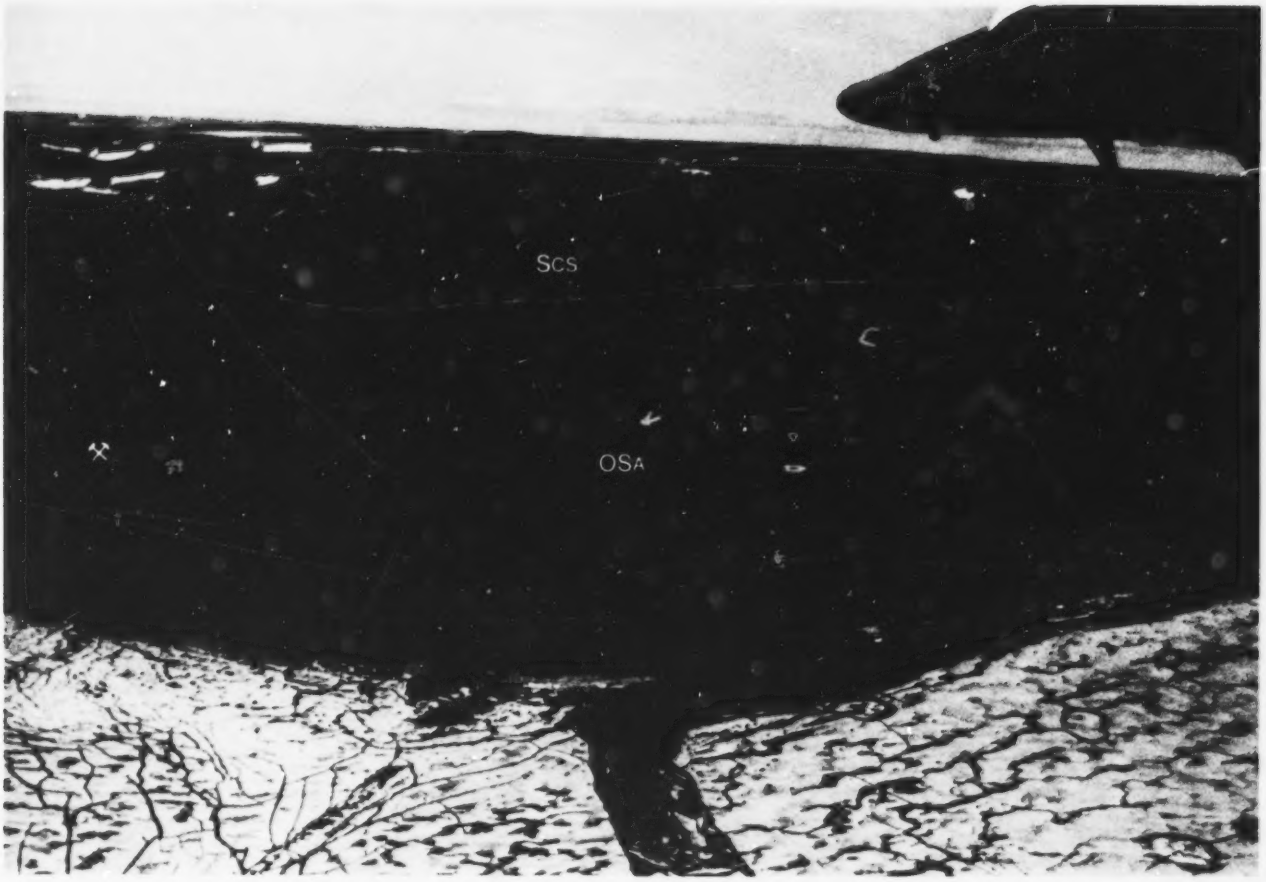

Figure 58. *Contact between the Allen Bay (OSA) and Cape Storm (SCS) formations at Cape Eardley Wilmot on the south coast of Devon Island (**Maxwell Bay**). View is to the northwest. The cape rises to an elevation of about 240 m. Crossed hammers mark approximate centre of traverse along which section 38 (Fig. 10) was measured.*

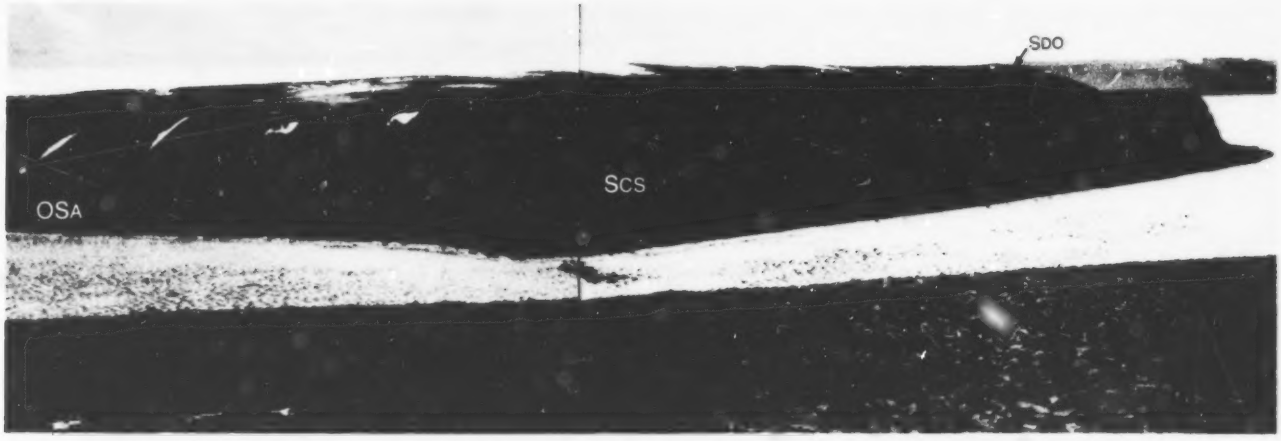

Figure 59. *Sea cliffs rising to an elevation of 340 m on the west side of an unnamed bay, about 10 km east of Viks Fiord on the north coast of Devon Island (**Bear Bay West**). View is to the northwest. The cliffs exhibit the best exposed section of the Cape Storm Formation (SCS) in the report area. OSA = Allen Bay Formation, SDO = Douro Formation.*

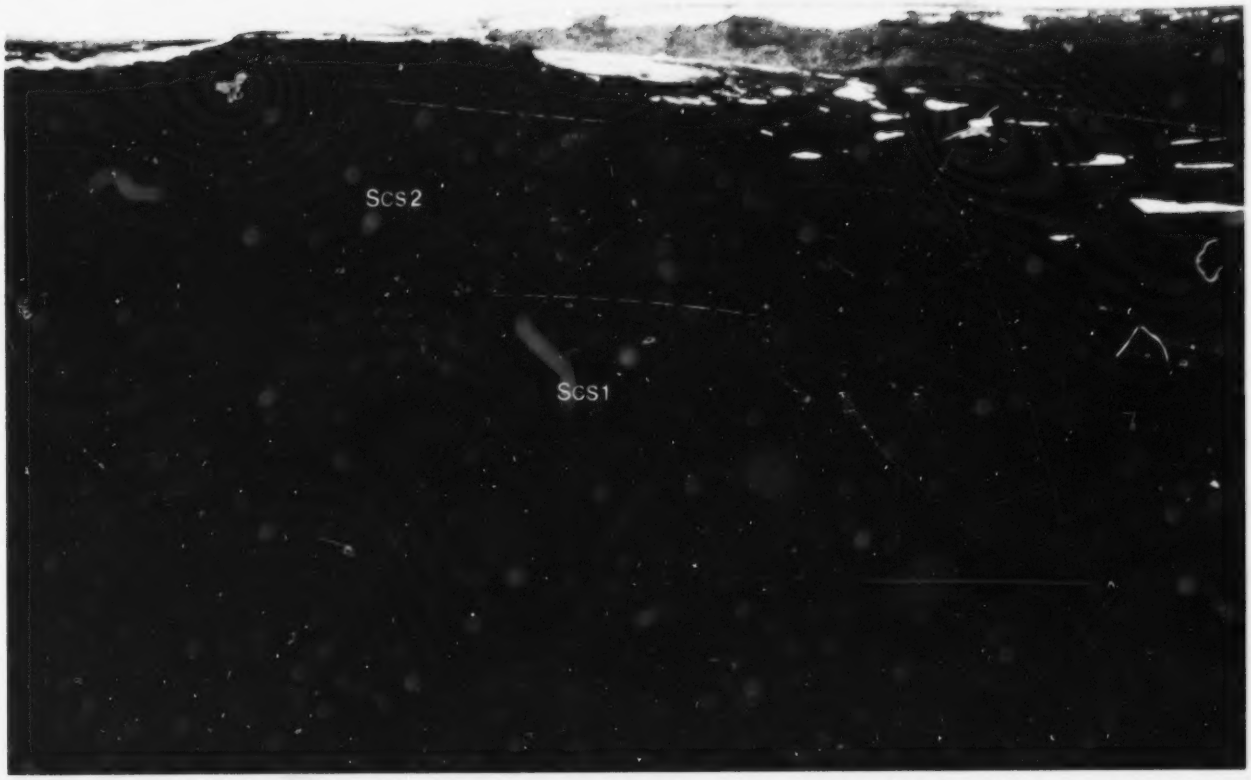

Figure 60. *Close-up view of the contact between the Cape Storm* (SCS) *and Douro* (SDO) *formations shown in Figure 59.* SCS1 = *lower, brown weathering division of Cape Storm;* SCS2 = *upper, greenish weathering division of Cape Storm.*

Douro Formation

Definition and distribution

The Douro Formation consists mainly of limestone that lies conformably on the Cape Storm Formation. The type section of the Douro is in northwestern Devon Island where it was established by Thorsteinsson (1963). In a recent revision of rocks previously assigned to the Read Bay Formation (Thorsteinsson and Fortier, 1954; see also Thorsteinsson, 1958), Thorsteinsson (in Thorsteinsson and Uyeno, 1981) elevated that formation to the rank of a group to include, in ascending stratigraphic order, the Douro, Barlow Inlet and Sophia Lake formations. Defined thus, the geographic distribution of the Douro includes, besides Devon Island, southwestern Ellesmere Island, Cornwallis Island, Somerset Island, Boothia Peninsula, and probably also Stefansson Island (see Thorsteinsson and Uyeno, *op. cit.*). The outcrop area of the Douro on Devon Island is a narrow, northerly trending band of territory extending across western parts of *Maxwell Bay* and *Bear Bay West.*

Lithology and thickness

Two measured surface sections (40, 41) of the Douro, including a full thickness of the formation (section 54), penetrated in the Imperial IOE Panarctic et al., Devon E-45 well, are shown on Figure 11. The Douro is 138 m thick in section 40 and 238 m thick in section 54, indicating that the formation thickens markedly in a westerly direction. In this connection, it is of interest to note that the formation is 335 m thick still farther to the west on Cornwallis Island (Thorsteinsson in Thorsteinsson and Uyeno, 1981).

The Douro consists mainly of two interbedded lithofacies. The dominant one, estimated to comprise about 90 per cent of the formation, is predominantly lime mudstone that is variably argillaceous, slightly dolomitic, and medium grey, with subordinate amounts of skeletal wackestone and shale. The shale occurs as bedding plane partings and thin interbeds. It is of interest to note that the amount of shale appears to increase from south to north along the main belt of Douro exposures, and also from east to west, as evidenced in the well. With increased amounts of argillaceous materials, the lime mudstone is commonly nodular (Fig. 63). Burrows, ripple marks, and prod marks are common in this lithofacies.

The second lithofacies occurs most commonly in the lower part of the formation. It consists of shelly pack-float- rud-stone. The principal fossils are brachiopods and crinoids, with lesser amounts of corals and cephalopods. Locally, this lithofacies forms small bioherms. Flat-pebble conglomerate is also associated with the lithofacies.

A minor, but noteworthy constituent of the Douro in the report area is the occurrence of mud mounds at the top of the formation in the *Bear Bay West* map area. The mounds vary in size from small features a few tens of metres in width and height to others as much as 400 m wide and several

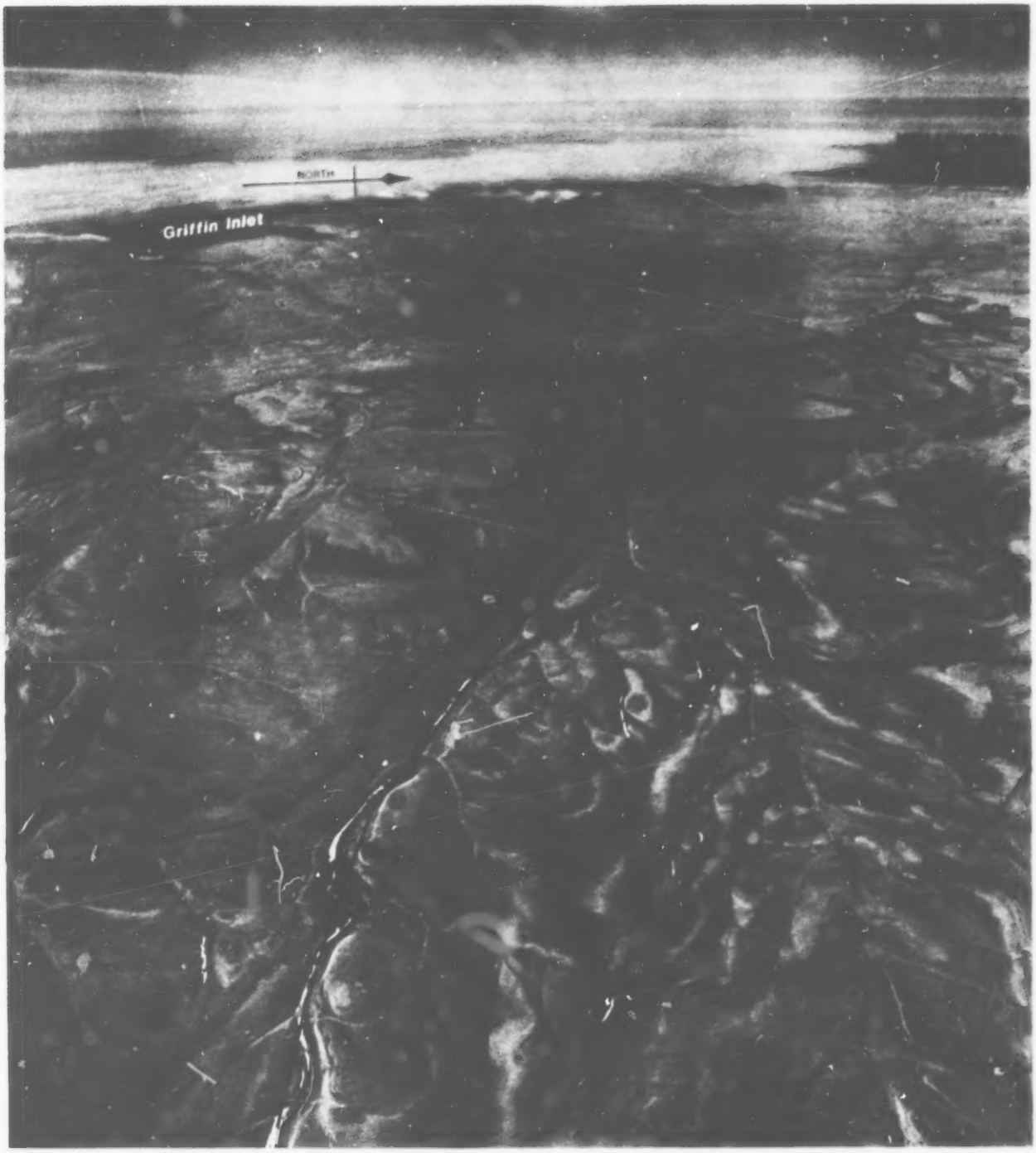

Figure 61. *Oblique aerial photograph (T441R-95) of western Devon Island (**Bear Bay West**). View is to the west, and more or less across the strike of bedrock. Dip is to the west. The photograph illustrates the typical weathering characteristics of the Cape Storm Formation (SCS) and Douro Formation (SDO) in the interior of the island. Note the smoothly rounded landscape that has developed on Douro and Cape Storm strata, reflecting the somewhat recessive weathering character of these formations. Note also the more distinctly banded appearance and lighter colour of the Cape Storm compared to the Douro. The darker colour of the Douro reflects the greater amounts of shale, both as interbeds with and impurities in the limestone that makes up most of the formation. The principal weathering colour of the Douro is a distinctive greyish green, whereas the principal weathering colours of the Cape Storm are various soft shades of grey, yellow, pink and particularly brown. SDB = Barlow Inlet Formation.*

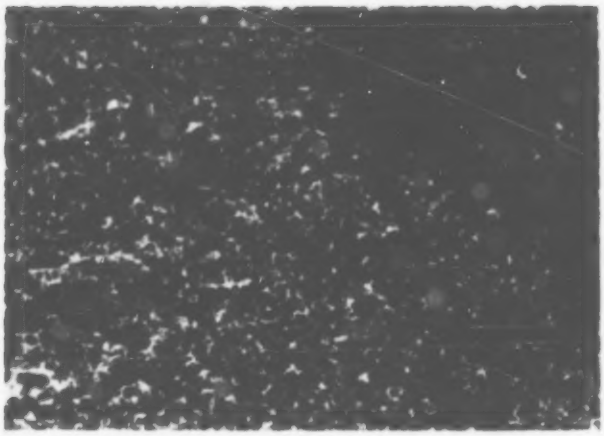

Figure 62. *Photomicrograph of limestone from the Cape Storm Formation. This medium grained calcarenite consists of silt-sized micrite clasts and skeletal fragments. Some silt-sized terrigenous material is also present between the carbonate grains. (C-77095, section 40, Fig. 11; composite stratigraphic section H, unit 2.)*

tens of metres high. About seven such mounds were observed at the top of the Douro during the course of field studies. The largest mound occupies the entire area of tiny Seal Island that lies off the west coast of the *Bear Bay West* map area. The mounds form paleotopographic highs with the Devon Island Formation, or with correlative rocks of the Barlow Inlet Formation that are draped over them.

One of the smaller mounds is well exposed along a northerly trending bank of the large unnamed river that enters the south side of Dragleybeck Inlet (*Bear Bay West*; see section 50, Fig. 11). It is about 15 m wide with an exposed height of 25 m. The base of the mound is not exposed. Most of the mound consists of thin bedded, greyish green, clotted lime mudstone, with abundant small structures that resemble *Stromatactis* sp. (Fig. 64), except for the absence of pronounced digitations on their upper surface. The bedding is horizontal in central parts of the mound, but at the north end of the mound the beds dip 38°, and there typical rocks of the Douro abut against the mound. At the south end of the mound, the inclination of the beds is less steep and rocks of the mound interfinger with skeletal (mostly crinoidal) rudstone and nodular shaly mudstone that comprise the top of typical Douro rocks. Much of the matrix of the rudstone appears to consist of recrystallized blue-green algal filaments. The mound is nearly devoid of invertebrate fossils except for rare corals, and crinoidal and brachiopod remains. Moreover, small neptunian dykes filled with brachiopodal rudstone occur in the central part of the core.

Basal contact

The contact between the Douro and Cape Storm formations is not especially well marked since it occurs within limestone beds of rather similar lithologies. Nevertheless, the Douro, because of its greater argillaceous content, is somewhat less resistant to erosion than the Cape Storm, and the contact between the formations, as observed in the coastal cliffs, is commonly marked as a slight topographic break that separates cliff-forming rocks below from rubbly-weathering slopes above (Fig. 63). Another criterion that is particularly useful in distinguishing the formations in the interior of Devon Island is their overall weathering colours. The principal weathering colours of the Douro are medium light grey to medium grey and especially greenish grey, which constrast with the dominantly lighter shades of grey, and varying shades of yellow and brown that characterize Cape Storm rocks. A word of caution is in order here: in some places, the upper limestone part of the Cape Storm exhibits a greenish weathering colour, but this is generally lighter and less distinctive than the greenish colour of the Douro rocks.

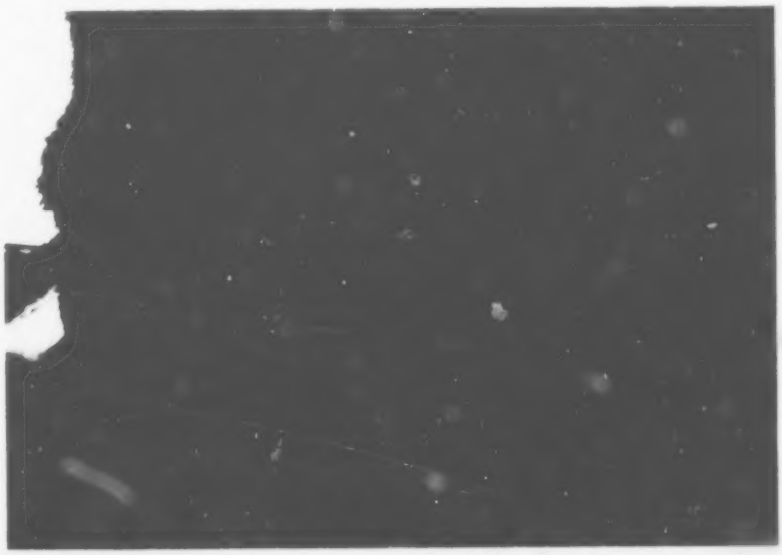

Figure 63. *Contact between the Douro and Devon Island formations in western Devon Island (**Bear Bay West**) where section 49 (Fig. 11) was measured. Head of hammer lies on the sharply defined contact that separates nodular weathering, medium light grey, argillaceous limestone of the Douro Formation from regularly bedded, medium dark grey, graptolitic rocks of the Devon Island Formation.*

Age

The age of the Douro in various parts of the archipelago has been discussed by Thorsteinsson and Uyeno (1981), who concluded that the formation lies entirely within the span of the *siluricus* Zone and is, therefore, middle to late Ludlovian in age. The conodont collections from the Douro Formation on Devon Island confirm this age assignment. They are identified below by T.T. Uyeno, who also comments on their age.

Section 50

GSC loc. C-79430; uppermost bed of formation

Kockelella variabilis Walliser
Ozarkodina confluens (Branson and Mehl) alpha morphotype of Klapper and Murphy (1975)
O. excavata excavata (Branson and Mehl)
Panderodus sp.
Age: Late Silurian, Ludlovian, *siluricus* Zone.

Section 49

GSC loc. C-79432; uppermost bed of formation

Kockelella variabilis Walliser
Ozarkodina confluens (Branson and Mehl) alpha morphotype of Klapper and Murphy (1975)

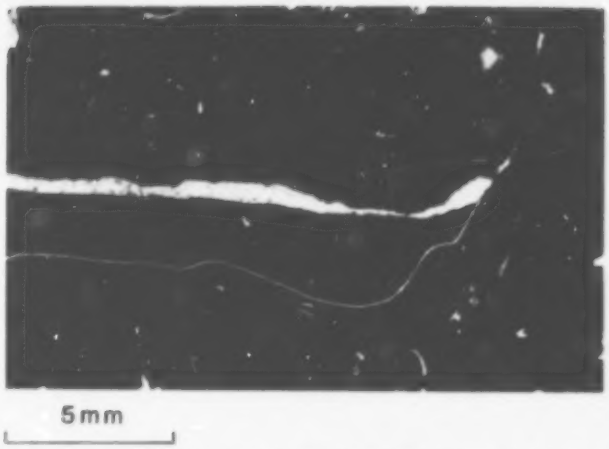

Figure 64. *Photomicrograph of limestone from the Douro Formation. The sample is from the flank of a mud mound. It is a lime mudstone with some skeletal debris, and contains* ***Stromatactis-like*** *features. The inked line marks the base of a cavity containing laminated sediment and sparry calcite. (C-77164, section 50, Fig. 11.)*

Figure 65. *Caswall Tower, a prominent landmark near the southwestern extremity of Devon Island (**Maxwell Bay**), rises to about 195 m above sea level. View is to the northwest with Radstock Bay in the foreground. A complete, fully exposed section of the Douro Formation occurs here. The beds forming the summit of the cliffs are referred to the Barlow Inlet Formation (SDe). SCS = Cape Storm Formation; SDO = Douro Formation.*

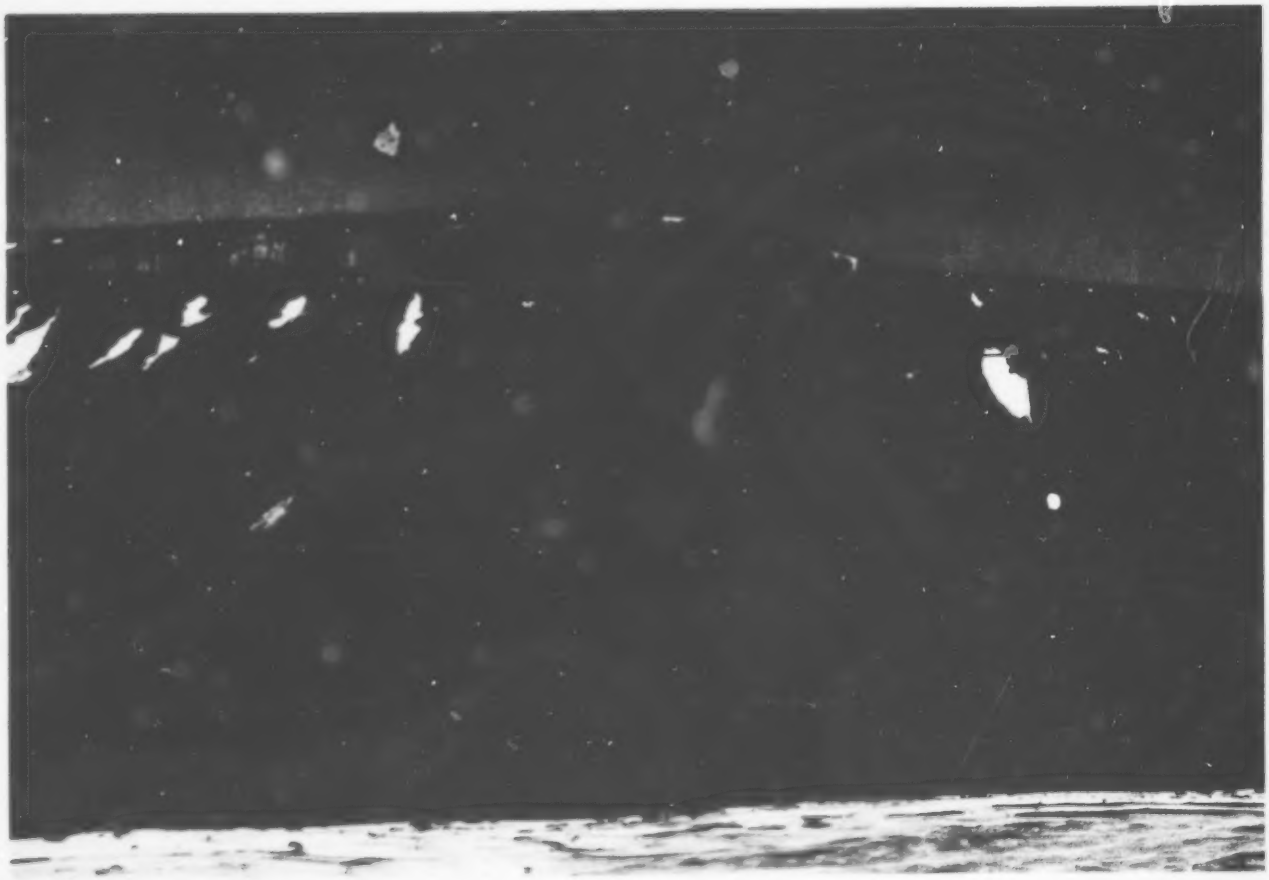

Figure 66. *Sea cliffs on the west side of Gascoyne Inlet near the southwestern extremity of Devon Island (**Maxwell Bay**) showing the Douro Formation (SDO) overlain by the Barlow Inlet Formation (SDB). The light coloured rocks in the Barlow Inlet are part of a bioherm formed mainly of stromatoporoids, whereas the dark coloured rocks are skeletal wackestone. The exposed thickness of the Barlow Inlet Formation shown here is about 60 m. Sections 41 and 42 (Fig. 11) were measured at this locality.*

O. excavata excavata (Branson and Mehl)
Panderodus sp.
Polygnathoides emarginatus (Branson and Mehl)
P. silurica Branson and Mehl
Age: Late Silurian, Ludlovian, *silurica* Zone.

Section 40

GSC loc. C-77455; 7.5-12.9 m above base of formation

Ozarkodina douroensis Uyeno

GSC loc. C-77454; 33.6-38.2 m above base of formation

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) morphotype indet.
Age: *Ozarkodina douroensis* Uyeno suggests the *silurica* Zone of Ludlovian age. It has been found previously in the Douro Formation in Cornwallis and Prince of Wales islands, and Boothia Peninsula (Uyeno, 1977; Uyeno in Thorsteinsson and Uyeno, 1981).

Upper Silurian to Lower Devonian

Barlow Inlet Formation

Definition, distribution and thickness

The Barlow Inlet Formation was erected by Thorsteinsson (in Thorsteinsson and Uyeno, 1981) for a sequence of mainly shelf-type carbonate rocks that had been referred to previously as members B and C of the Read Bay Formation in Cornwallis Island (Thorsteinsson, 1958). It is now the middle formation in the Read Bay Group (Thorsteinsson op. cit.). The distribution of the Barlow Inlet is limited to Cornwallis Island and Devon Island, and includes the smaller islands of Griffith and Lowther in Barrow Strait. Full thicknesses of the formation occur only on Cornwallis and Devon islands. On Devon Island, the Barlow Inlet forms a relatively broad belt of westerly dipping exposures in western parts of the *Maxwell Bay* map area and extends northward to about the mid-latitude of the *Bear Bay West* map area, where the formation passes laterally into the Devon Island Formation.

The Barlow Inlet Formation on Cornwallis Island is 1419 m thick and includes two members of disproportionate thickness: a lower member that attains a maximum thickness of 65 m and consists mainly of calcareous shale and subordinate sandstone; and an upper member that is 1345 m thick and is made up mainly of limestone and dolomite. No complete thickness of the Barlow Inlet was measured on Devon Island, but the Devon E-45 well penetrates an almost complete section that is 702.9 m thick, and the total maximum thickness of the formation in the report area is estimated as about 750 m. The formation overlies Douro rocks with a sharp, conformable contact (Fig. 66). It is topographically prominent (Fig. 67), and in the environs of Erebus and Terror bays near the southwestern extremity of the island, it stands in a series of bold headlands and forms the historic island of Beechey.

Lithology

Nine measured surface sections (41-47, 55) of the Barlow Inlet, including a section (54) of the formation in the Devon E-45 well are shown on Figure 11.[1]

The lower shale member is recognized only in the Devon E-45 well,[2] and elsewhere the formation consists of carbonate rocks only. The shale member in the well is 21.4 m thick (Mayr, 1978) and consists of dark brownish shale that is silty and dolomitic.

The upper member of the Barlow Inlet Formation in the report area is a remarkable homogeneous assemblage of carbonate rocks that presents many of the same lithological characteristics from bottom to top. The rocks comprise two main intercalated lithofacies: a mainly medium to thick bedded limestone facies, the predominant facies; and a mainly thin bedded limestone and dolomite facies that occurs in units seldom more than 20 m in thickness.

The medium to thick bedded lithofacies consists of dolomitic, medium grey mudstone and skeletal wackestone, and lesser amounts of flat-pebble conglomerate and pelletal grainstone. The limestone is commonly slightly nodular or contains numerous, wavy, dolomitic partings with quartz and feldspar silt. Labyrinthine dolomitic mottling was observed in one unit. Hematite-coated hardgrounds occur at several levels. Lenses of skeletal pack-, float- or rud-stone, composed mainly of crinoidal debris and brachiopods, occur throughout this lithofacies. The flat-pebble conglomerate is made up of fragments of either the medium to thick bedded lithofacies or the thin bedded lithofacies (Fig. 68). Also present in the medium to thick bedded lithofacies are numerous small biohermal and biostromal units, and one large carbonate buildup. The smaller features range up to 20 x 7 m in size. Spherical and hemispherical stromatoporoids form the bulk of the framework with lesser amounts of corals. Intra-framework material consists of crinoids and brachiopod debris. In northern parts of the distributive area of the formation, the bioherms are dolomitized and extremely porous. A large carbonate buildup occurs at Gascoyne Inlet on the south coast of the island (section 42, see also Figure 66). It is about 200 m wide and 70 m thick. The reef consists of a massive framestone of large, tabular stromatoporoids and colonial, rugose corals with rare brachiopods and gastropods. The frame-forming organisms are estimated to constitute about 70 per cent of the rock. The material between the coelenterate colonies is crinoidal grainstone and rudstone. Reef-flank sediments were observed in section 41. They include massive, biohermal grainstone interbedded with skeletal wackestone.

The thin bedded lithofacies occurs as intercalated units, up to 20 m thick, in the medium to thick bedded lithofacies. Contacts between the lithofacies are gradational. The thin bedded lithofacies consists of very thin to thin bedded, light to medium grey, calcisiltite and detrital dolomite. These rocks are commonly characterized by planar lamination, small-scale crossbedding and ripple crosslamination. The laminae are formed by silt-sized quartz grains and mica flakes. Synaeresis and desiccation cracks are common. Pellets and micrite mud are the main textural constituents. Some intervals are very silty. There are, moreover, numerous zones where the rock is composed of coquinas of leperditicopid ostracodes. In one sample, fragments of phylloid algae were observed. Some intervals of the lithofacies are made up of stromatolitic boundstone. Aside from ostracodes, the lithofacies is rather poor in invertebrate fossils, and skeletal remains are mostly those of ostracodes and gastropods.

The principal fresh surface, and weathering colours of the formation are light shades of grey, yellow and brown, with some exposures weathering to dark yellowish orange.

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[1] The correlations of the various sections outlined on Figure 11 vary from reasonably well established to near guesswork. Sections 41 and 40 include the basal contact of the Barlow Inlet Formation and can, therefore, be correlated with reasonable certainty with one another, and with the Devon E-45 well (section 54). On the basis of marker beds, section 43 apparently can be correlated with section 44. The correlation of the reefoid mass illustrated as section 42 can also be related to section 41 as both sections were measured in the same cliff exposures (Fig. 66). Similarly, sections 47 and 55 were measured along a stream and can be related to each other on the basis of continuity of strata. But these sections, which can be related with certainty to the upper contact of the formation, are only presumed to overlap with beds in the top of the Devon E-45 well. There is considerable uncertainty concerning the correlation of sections 44 to 46. Although these sections occur within a rather limited area of southwestern Devon Island, they are separated from one another by areas of Quaternary cover that could conceivably be underlain by faults. The correlations of sections 44 to 46 are based on two principal lines of reasoning: the evidence of the fossils, however tenuous, which is provided in a later discussion; and the geographic locations of the sections within the westerly dipping homoclinal succession of Barlow Inlet beds, indicating that the sections are progressively younger as traced from east to west. It should be noted that section 46 is part of the main belt of continuous Barlow Inlet exposures and, as is evident in the *Maxwell Bay* map area, clearly consists of beds near the top of the formation.

[2] The lower member of the Barlow Inlet Formation, which equates with member B of the Read Bay Formation in earlier nomenclature, was identified originally in the Devon E-45 well by Mayr (1978) and includes beds represented in the interval from 452.9 to 492.3 m. This identification is now considered to be incorrect. In the light of the present investigation, the member is identified as occurring between 681.5 and 702.9 m.

Figure 67. *Oblique aerial photograph (T441R-125), looking westward over exposures of the Barlow Inlet Formation (SDB) in western Devon Island (**Bear Bay West**). The photograph illustrates the uniform weathering characteristics of the Barlow Inlet that reflect the relatively pure and homogeneous carbonate composition of this resistant formation. The numerous northeasterly trending lineaments in the left foreground are probably faults with minor stratigraphic displacement. The outcrops of the Sophia Lake Formation (DSL), outlined on the west coast of the island, are illustrated by a vertical aerial photograph reproduced as Figure 69. Arrow points to the approximate location of the only well drilled to date on Devon Island (Imperial IOE Panarctic et al. Devon E-45).*

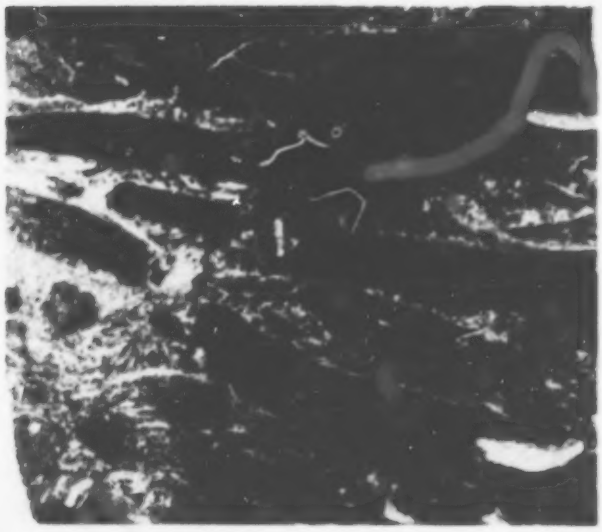


Figure 68. *Photomicrograph of intraformational conglomerate from the upper member of the Barlow Inlet Formation. The pebbles consist of fragments of the thin bedded lithofacies. Intergranular matrix contains brachiopod fragments, very fine grains of quartz, pellets and mica flakes. (C-79663, section 44, Fig. 11; composite stratigraphic section 1, unit 36.)*

Age

The Barlow Inlet Formation yields the usual varied assemblages of invertebrate fossils that typify most Silurian shelf-type carbonate rocks, but only the conodonts and certain brachiopods obtained in the course of the present investigations have been studied. The conodonts, as identified by T.T. Uyeno, are as follows:

Section 41

GSC loc. C-77480; 10.5-14.8 m above base of formation

Ozarkodina confluens (Branson and Mehl) morphotype undesignated
O. excavata excavata (Branson and Mehl)

GSC loc. C-77483; 37.9 m base of formation

Ozarkodina excavata excavata (Branson and Mehl)

GSC loc. C-77485; 54.9-58.2 m above base of formation

Ozarkodina confluens (Branson and Mehl) morphotype undesignated
O. excavata excavata (Branson and Mehl)

Remarks: Uyeno states that *Ozarkodina confluens* and *O. excavata excavata* are relatively long-ranging species, but that their association indicates a Late Silurian age.

Section 44

GSC loc. C-77150; 1 m above base of section

Ozarkodina confluens (Branson and Mehl) morphotype undesignated
O. excavata excavata (Branson and Mehl)

GSC loc. C-79659; 116.3-116.8 m above base of section

Ozarkodina n. sp. H (in Uyeno, 1981)
Pedavis sp. aff. *P. thorsteinssoni* Uyeno

GSC loc. C-79669; 203.0-207.8 m above base of section

Ozarkodina confluens (Branson and Mehl) alpha morphotype

Remarks: According to Uyeno, "*Pedavis*" sp. aff. *P. thorsteinssoni* (in C-79659) suggests the *latialata* Zone of latest Ludlovian age on the ground that it has been previously found to occur with the zonal index species *Pedavis latialata* (Walliser) in the Barlow Inlet Formation in Cornwallis Island, and in the Somerset Island Formation in Boothia Peninsula (Uyeno in Thorsteinsson and Uyeno, 1981).

Section 45

GSC loc. C-77487; 1.5 m above base of section

Ozarkodina confluens (Branson and Mehl) morphotype undesignated

GSC loc. C-77489; 11.3 m above base of section

Ozarkodina confluens (Branson and Mehl) alpha morphotype and an undesignated morphotype of Klapper and Murphy (1975)

GSC loc. C-77498; 114.7 m above base of section

Ozarkodina confluens (Branson and Mehl) alpha morphotype of Klapper and Murphy (1975)

GSC loc. C-77499; 137.6 m above base of section

Pelekysgnathus n. sp. B of Uyeno (1981)

Remarks: Uyeno has noted that *Pelekysgnathus* n. sp. B has been previously recorded only from the lower beds of the Sophia Lake Formation in Cornwallis Island, where it is associated with *Ozarkodina* n. sp. G (Uyeno, 1981), and therefore, dated as early Lochkovian. The presence of *Pelekysgnathus* n. sp. B in sample C-77499 may indicate a

similar age, but the possibility that this species ranges into rocks of latest Silurian age cannot be discounted on the basis of available information.

Section 46

GSC loc. C-77184; 19-34 m above base of section

Ozarkodina confluens (Branson and Mehl)
Pelekysgnathus sp. indet.

GSC loc. C-77192; 114.4-148.6 m above base of section

Ozarkodina confluens (Branson and Mehl) alpha and gamma morphotypes of Klapper and Murphy (1975)
O. sp. cf. *O.* sp. F. of Klapper and Murphy (1975)
Pelekysgnathus arcticus Uyeno

GSC loc. C-77193; 156-158 m above base of section

Ozarkodina confluens (Branson and Mehl) alpha, beta, and gamma morphotypes of Klapper and Murphy (1975)
Pelekysgnathus arcticus Uyeno

Remarks: According to Uyeno, the above faunas cannot be dated more accurately than late Silurian, and more probably are of Pridolian age.

As already noted, the faunas just described are from measured sections of the formation in the *Maxwell Bay* map area. Two collections of conodonts from isolated outcrops of the Barlow Inlet in the *Bear Bay West* map area are described below, and are of interest in providing additional information on the upper age range of the formation. The identifications and age determinations were also by T.T. Uyeno.

Station 62

GSC loc. C-79484; stratigraphic position uncertain, but probably in upper 100 m of formation

Ozarkodina confluens (Branson and Mehl) form approaching delta morphotype of Klapper and Murphy (1975)
O. excavata excavata (Branson and Mehl)
O. remscheidensis remscheidensis (Ziegler)
O. sp. cf. *O.* n. sp. E of Klapper and Murphy (1975)
Pelekysgnathus n. sp.
Age: Late Silurian, Pridolian; uppermost *eosteinhornensis* Zone.

Station 63

GSC loc. C-79449; 15.25 m below top of formation

Ozarkodina remscheidensis remscheidensis (Ziegler)
Age: Pridolian to early Lochkovian; uppermost *eosteinhornensis* Zone to *delta* Zone.

The evidence of the conodont faunas from the Barlow Inlet Formation on Devon Island indicates a reasonably firm age range of latest Ludlovian (*latialata* Zone) to latest Pridolian (uppermost *eosteinhornensis* Zone). There is, moreover, a good possibility that the lowermost part of the formation includes beds of early Ludlovian age (i.e. the *siluricus* Zone of about middle Ludlovian age), in view of the presence of the *siluricus* Zone in laterally equivalent beds in the lower part of the Devon Island Formation (see discussion under heading of the formation). Furthermore, that the uppermost beds of the Barlow Inlet in the report area are early Lochkovian in age seems probable, on the basis of the evidence that this is the case on nearby Cornwallis Island (Thorsteinsson and Uyeno, 1981).

B. Jones has identified *Atrypoidea phoca* from five separate levels (C-79662, C-79664, C-79666, C-79668 and C-79670) in the upper part of section 44. He also has identified *Atrypoidea* n. sp. from four separate levels (C-77491, C-77492, C-77495 and C-77496) in the lower part of section 45. The stratigraphic separation of these species in these sections is of interest insofar as it suggests that section 45 is probably entirely younger than section 44.

Lower Devonian

Sophia Lake Formation

Definition and distribution

The Sophia Lake Formation was established by Thorsteinsson (in Thorsteinsson and Uyeno, 1981) for exposures consisting mainly of carbonate rocks in eastern Cornwallis Island. It is the youngest formation in the Read Bay Group. The type section, which is about 560 m thick, is interposed conformably between the underlying Barlow Inlet Formation and overlying Snowblind Bay Formation.

Outcrops of the Sophia Lake Formation in the archipelago are confined to the environs of Wellington Channel, namely the islands of Cornwallis, Baillie Hamilton and Devon.

The Sophia Lake Formation occurs in a series of isolated, west-dipping outcrop areas along the west coast of Devon Island (*Maxwell Bay*, *Bear Bay West*). The Sophia Lake represents the youngest formation in the conformable succession of lower Paleozoic rocks in the report area, and the present day erosion surface marks the upper limit of the formation. The contact with the underlying Barlow Inlet Formation is sharply defined, conformable, and easily determined on the ground or on aerial photographs (Fig. 69). It is marked by an abrupt change from mainly thin to thick bedded, pure carbonate rocks of the Barlow Inlet, to dominantly thin bedded, impure carbonate and siltstone rocks of the Sophia Lake. Equally significant is the fact that the transition from one formation to another is marked by a distinct change in weathering characteristics. The Sophia Lake is, for the most part, a relatively nonresistant formation, but it includes alternating harder and softer units (Fig. 70) that impart a distinctive banded appearance to both exposures and the upland surfaces developed on the formation (figs. 69, 71). Furthermore, the weathering colours of the formation are varied, and though dominantly medium light grey, they also include pastel shades of green, brown, yellow and red, all of which contrast rather markedly with the drab grey, yellow and brown weathering colours of the Barlow Inlet Formation.

Lithology and thickness

Only two sections (47, 48, Fig. 11) of the Sophia Lake Formation were studied in detail and they cannot be related directly to each other. Although the entire thickness of the Sophia Lake is considered to have been examined cursorily at one place or another during the course of field investigations, the lithological characteristics of the formation are, nevertheless, inadequately understood, and the maximum thickness of Sophia Lake beds preserved on Devon Island can only be estimated as about 250 m.

A broad, two-part subdivision appears to characterize the formation in the report area: a basal sequence of beds, about 200 m thick, consisting mainly of dolomite with subordinate amounts of limestone and siltstone; and an upper sequence made up of dolomite, limestone and gypsum, about 50 m thick.

Lower division: The dolomite is typically very thin to medium bedded and medium light grey in colour, but it also includes beds that vary from light grey to medium dark grey, and subordinate amounts of beds that are pastel shades of green, brown, yellow and red. The dolomite consists mainly of finely crystalline euhedra of silt-sized detrital dolomite. It is, moreover, characteristically laminated, with laminae commonly affected by subtle changes in grain size and varying amounts of silt-sized silicate clasts, particularly quartz and feldspar (Fig. 72). Other types of laminae include cryptalgal, aphanocrystalline dolomite with bird's-eye texture, and rare stringers of limestone. Most dolomite beds include variable amounts of silicate clasts which, in some instances, exceed 50 per cent of the rock and form dolomitic siltstone. About 90 per cent of the silicate clasts are quartz, with the remainder including mainly feldspar and subordinate amounts of mica and chlorite. Rare desiccation fractures and flat-pebble conglomerate were also observed in the dolomite.

The limestone is mainly very thin to medium bedded with fresh surface colours that are mostly shades of brown and grey. It ranges from lime mudstone with laminae of finely crystalline dolomite, to skeletal debris (mainly ostracodes), and burrowed pelletal and codiacean grainstone. As in the case of the dolomite, the limestone is commonly silty with varying amounts of silicate clasts.

The rocks classified here as siltstone are strikingly similar in most respects to the dolomite described above, and invariably appear to contain a high percentage of dolomite. These rocks, and the dolomite that is rich in silicate fractions, appear to form most of the recessive weathering units within the formation.

Upper division: The uppermost exposures of the formation preserved in the report area consist of alternating units of mainly very thin bedded carbonate rocks, as described above, and gypsum, in about equal proportions (Fig. 73). The gypsum is commonly argillaceous and laminated. The limestone and dolomite are of much the same lithological character as those of the lower division described earlier.

Age and correlation

Leperditicopid ostracodes occur rather commonly throughout Sophia Lake beds. The only other megafossils observed were rare gastropods, bryozoans, and stromatoporoids. The formation has yielded two small collections of conodonts. They were identified by T.T. Uyeno, who has also commented on their ages:

Section 48

GSC loc. C-77198; 5.3-6.3 m above base of section

Ozarkodina n. sp. F of Klapper and Murphy (1975)
Age: late Silurian to early Early Devonian (latest Pridolian to early Lochkovian); *hesperius* Zone to *eurekaensis* Zone.

Section 47

GSC loc. C-79497; 18.5 m above base of formation

Ozarkodina remscheidensis remscheidensis (Ziegler)
Age: late Pridolian to early Lochkovian; uppermost *eosteinhornensis* Zone to *delta* Zone.

As noted from Uyeno's remarks, the above faunas cannot be dated more accurately than latest Pridolian or early Lochkovian. However, in view of the fact that the Pridolian-Lochkovian boundary is situated near the top of the Barlow Inlet Formation on nearby Cornwallis Island (Thorsteinsson and Uyeno, 1981), it seems reasonable to assume that this boundary is also within the upper part of that formation on Devon Island. It is also of interest to note that the age span of the Sophia Lake on Cornwallis Island, where a full thickness of the formation is preserved, is about early to middle Lochkovian, and as such the Sophia Lake is correlative with the upper part of the type section of the Devon Island Formation, and probably also with the Sutherland River Formation (see Thorsteinsson and Uyeno, *op. cit.*).

Devon Island Formation

Definition, distribution and thickness

The Devon Island Formation was named by Thorsteinsson (1963b) in northwestern Devon Island, where it is represented as a relatively thin map unit consisting of dark-coloured, graptolitic quartz siltstone and carbonate rocks. The type section is situated about 50 km northwest of the northwestern extremity of Devon Island, as that area is defined in the present account. There, the Devon Island Formation overlies the Douro Formation and underlies dolomitic rocks of the Sutherland River Formation. The formation is also present in southwestern Ellesmere Island (Kerr, 1969, 1970; Thorsteinsson and Uyeno, 1981).

The Devon Island Formation occupies a narrow strip of territory, about 55 km in length, along Wellington Channel in the *Bear Bay West* map area, and southeastward, the formation passes laterally into the Barlow Inlet Formation. Throughout its areal extent the Devon Island is made up of a relatively uniform succession of interbedded, argillaceous limestone and lesser amounts of shale, and lies on the Douro

Figure 69. Vertical aerial photograph (A16332-202) at Bowden Point and vicinity on the west coast of Devon Island (Bear Bay West). The photograph illustrates the banded weathering characteristic of the Sophia Lake Formation (DSL) that contrasts markedly with that of the underlying Barlow Inlet Formation (SDB).

*Figure 70. Sophia Lake Formation near Wellington Channel, about 3.5 km north of Cape Osborn on the west coast of Devon Island (**Bear Bay West**). The lower part of the formation – probably within 30 m of base – is shown here. Aircraft sits on resistant unit of lime mudstone that is thin bedded and brownish coloured. This unit is overlain by 6.7 m of soft weathering, interbedded, greyish green, dolomitic shale, and minor amounts of dolomite. The uppermost beds at left consist of one metre or more of brownish weathering, finely crystalline dolomite.*

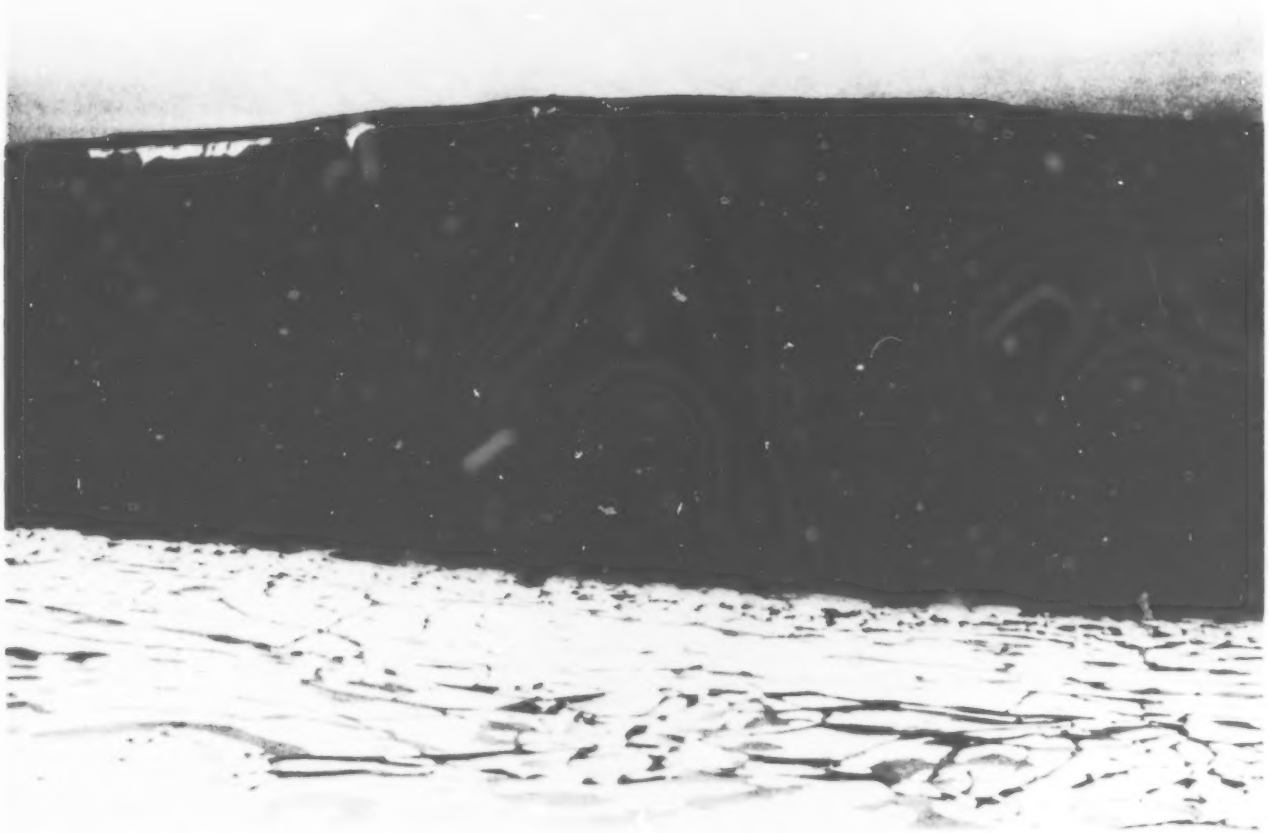


***Figure 71.** Sea cliffs, exposing rocks of the Sophia Lake Formation at Domville Point on the west coast of Devon Island (**Bear Bay West**) where section 48 (Fig. 11) was measured. View is to the east. Wellington Channel in foreground. Note characteristic alternation of soft and harder weathering units in the formation. About 150 m of beds near the middle of the formation are exposed here. Note also the steeply dipping normal fault that bifurcates above the middle of the cliffs.*

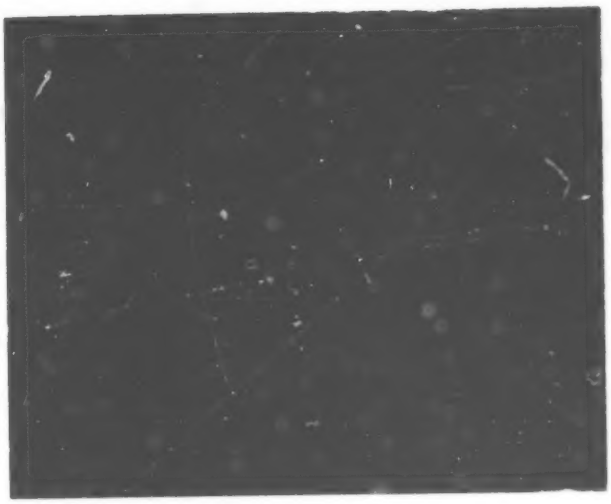


Figure 72. *Photomicrograph of dolomite from the Sophia Lake Formation. The rock is a fine to medium grained, detrital dololutite with crosslamination. Quartz grains are common in the coarser, lighter coloured laminae. Disturbed laminae in the upper right-hand corner may indicate bioturbation. (C-79674, section 48, Fig. 11; composite stratigraphic section R, unit 21.)*

Formation with an abrupt, yet conformable contact (Fig. 63). The regional strike of the formation is northwesterly; the dip is to the southwest; and because the formation outcrops up to the shore of Wellington Channel, the upper contact is nowhere preserved.

The formation is generally poorly exposed. The best exposures occur along the lower reaches of the large unnamed river that enters the south side of Dragleybeck Inlet. The total thickness of Devon Island strata preserved in the report area can only be estimated as about 600 m, of which perhaps less than one third is represented by actual exposure. Nevertheless, because the Devon Island Formation is the chronological equivalent of the entire Barlow Inlet Formation, including also a part, and possibly all of the Sophia Lake Formation (Thorsteinsson and Uyeno, 1981), the total thickness of Devon Island strata in the vicinity of the facies change was, prior to the formation of Wellington Channel, greater than that of the Barlow Inlet, which is estimated as 750 m thick.

The zone of facies changes, from Devon Island to Barlow Inlet rocks, occurs along an irregular east-west line immediately south of the unnamed river. It is marked by a change from typical light coloured, thin to thick bedded and massive, shelf-type limestone and dolomite in the south, to dark coloured, very thin to thin bedded argillaceous limestone and shale in the north. In addition, the facies change separates rocks with shelly faunas in the south from mainly graptolite-bearing rocks in the north, and it marks also a distinct change in the topographic expression of the two formations. The Devon Island is a relatively nonresistant unit that underlies an extensive lowland, characterized chiefly by marine strand lines, lakes and tundra, whereas the resistant rocks of the Barlow Inlet are characterized by barren rounded hills and flat-topped remnants of the Devon Island plateau. The facies change appears to be mainly one of intergradation of carbonate beds and, to a lesser extent, intertonguing of shale that was presumably derived from the northwest.

Lithology

One measured section (49) of the Devon Island Formation is shown graphically on Figure 11 (see also Figure 63). The section occurs near the zone of facies change with Barlow Inlet strata. It is 92.8 m thick and represents the basal part of the Devon Island. The section is made up of very thin to thin bedded, medium grey, argillaceous limestone with subordinate amounts of calcareous shale. The limestone is mainly laminated mudstone, with the laminae reflecting small changes in grain size. In some beds, sponge spicules and fragments of brachiopods are sufficiently abundant to form skeletal wackestone. Numerous burrowed zones, characterized by concentrations of pelletal grainstone, are also evident. Terrigenous materials include quartz, feldspar and mica. The limestone is also composed of minor amounts of skeletal grainstone and rudstone composed of crinoidal, brachiopodal and phosphatic skeletal fragments occurring as discrete units of rock. Rare fragments of calcareous algae are also present in these beds. The shale, which comprises about 10 per cent of the section, is calcareous, commonly fissile, and occurs as very thin interbeds and bedding plane partings.

Cursory study of numerous other exposures of the Devon Island Formation in the report area indicates that the lithological characteristics of the above section are more or less typical of the formation as a whole.

Regional relationships and age

The Devon Island Formation in ***Bear Bay West*** is part of a continuous belt of Devon Island exposures, some 85 km in length, that traces a northwesterly path beyond that map area into northwestern Devon Island to where the formation is terminated by faulting, a short distance to the west of Sutherland River (see map 1421A in Morrow and Kerr, 1977). Two well exposed and abundantly fossiliferous sections of the Devon Island that occur near the northwestern extremity of this belt of exposures are of particular interest to the authors of the present study. They have been described and illustrated as figures 23 and 24 in Thorsteinsson and Uyeno (1981). These figures are reproduced herein as figures 74 and 75. One of the sections (Fig. 74) occurs on Sutherland River,[1] the other (Fig. 75) about 4.5 km to the southeast. In order to understand the lithological changes that characterize the Devon Island as traced from southeast to northwest along this 85 km belt of exposure, as well as the total age span of the formation and its depositional environment, it is necessary to review the salient lithological and faunal characteristics of these two sections.

The section of the Devon Island on Sutherland River is 210 m thick, and is described by Thorsteinsson (in Thorsteinsson and Uyeno, 1981, p. 16) as consisting of two parts: "A lower unit about 182 m thick, consisting of a

[1] As a point of interest, the section on Sutherland River is 7.5 km southwest of the type section of the formation.

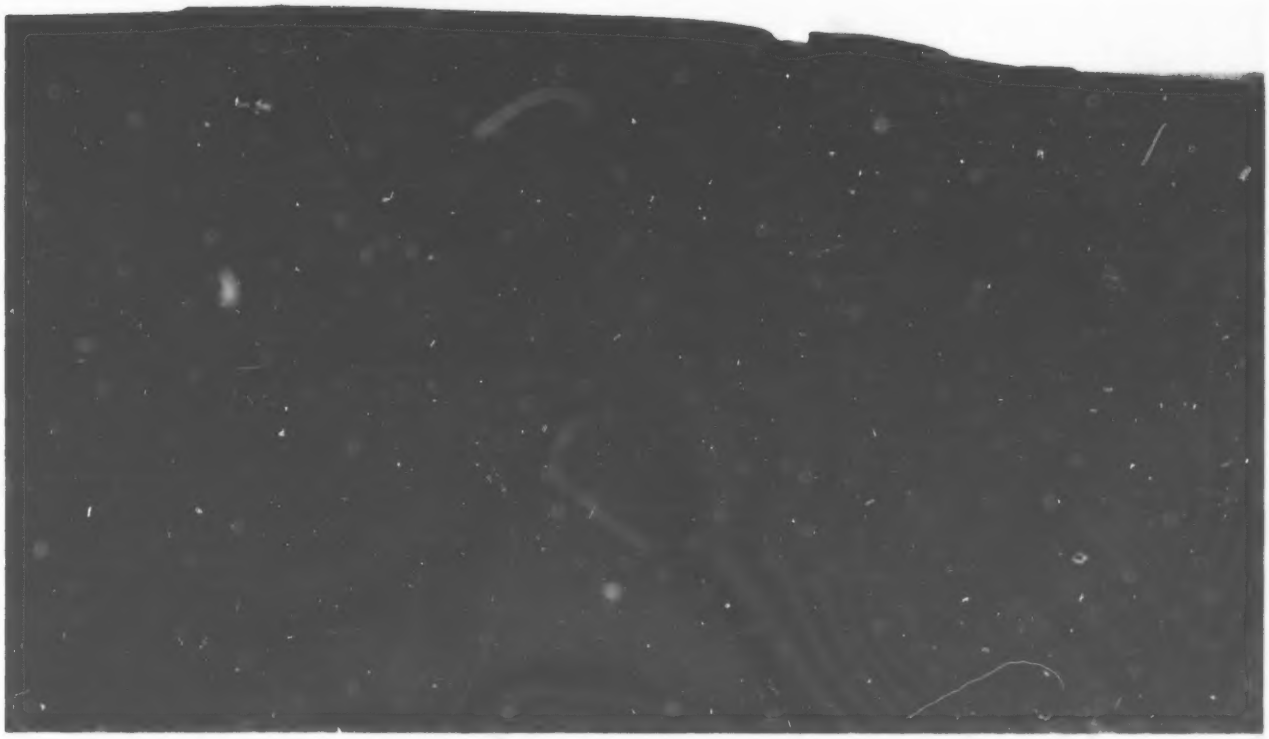


Figure 73. *Upper gypsum-bearing part of the Sophia Lake Formation at Cape Daniell on the west coast of Devon Island (**Bear Bay West**).*

remarkably homogeneous appearing succession of siltstone that is variably calcareous and dolomitic, with lesser amounts of interbedded dolomite, mudstone and wackestone. These rocks vary from medium grey to medium dark grey in colour, and occur mainly as thin planar beds. An upper unit, about 48 m thick, consists mainly of dolomite and subordinate interbeds of siltstone. The dolomite is commonly medium dark grey in colour, finely crystalline, and occurs in medium to mainly thin beds, and some beds are characterized by vuggy porosity. The siltstone is as described in the lower unit". Most beds are planar laminated.

The faunas from these sections, considered as a whole, indicate an age span of late Ludlovian to early Lochkovian for the Devon Island Formation. A latest Ludlovian age is indicated by the conodont index species *Pedavis latialata* collected from talus in the stratigraphically lower part of the formation; and, in this connection, it is of interest to note that *Polygnathoides siluricus*, name bearer of the penultimate Ludlovian conodont zone, occurs in the uppermost beds of the underlying Douro Formation. That all of Pridolian time is probably represented in the Sutherland River section (Fig. 74) is indicated by a talus collection with *Monograptus formosus* of early Pridolian age (= Zone of *M. ultimus*), and by *M. transgrediens*, index species of the highest Pridolian graptolite zone, which occurs *in situ* at two separate horizons near the bottom of the section. Early Lochkovian time is indicated by *M. uniformis*, name bearer of the earliest Devonian graptolite zone, still higher in the section.

Of particular interest in these sections is the condensed nature of late Ludlovian and Pridolian beds. The presence of strata of latest Ludlovian age, attested to by *Pedavis latialata*, in the Sutherland River section has been noted previously. In the section east of the river (Fig. 75), *Monograptus formosus* occurs 4.25 m above the base of the Devon Island, while *M. transgrediens* occurs at levels 4.5 and 8.8 m. A mainly covered interval separates the highest occurrence of these Pridolian graptolites from a relatively abundant brachiopod and conodont fauna (C-33700) at the 30.5 m level. Although the conodonts in sample C-33700 cannot be dated more accurately than latest Pridolian or early Lochkovian, the presence of *Cyrtina* among the brachiopods suggests a Lochkovian age. Apparently, therefore, late Ludlovian and all of Pridolian time are represented in the section east of Sutherland River by less than 30.5 m of beds. This interval is roughly correlative with a complete thickness of the Barlow Inlet Formation, which, as noted earlier, is about 750 m thick in the report area; and, therefore, also with a roughly equivalent thickness of the Devon Island Formation, near the region of facies change with the Barlow Inlet. In other words, the beds of late Ludlovian and Pridolian age in the Devon Island Formation thin by a factor of 24 or less in the 85 km belt of exposures

that extends from the region of facies change in the southeast to Sutherland River in the northwest.

The faunas obtained from the Devon Island Formation in *Bear Bay West* are given below:

Section 49

GSC loc. C-79490; 36 m above base of formation

Polygnathoides siluricus Branson and Mehl
P. emarginatus (Branson and Mehl)
Ozarkodina excavata excavata (Branson and Mehl)

The above identifications were made by T.T. Uyeno, who correlated the faunas with the *siluricus* Zone of middle to late Ludlovian age.

Section 50

GSC loc. C-79431; 2.5 m above base of formation

Monograptus bohemicus tenuis Bouček

The above collection was made from Devon Island beds that lie stratigraphically above the small mud mound described on page 69, as occurring at the top of the Douro Formation. *M. bohemicus tenuis* is of latest Ludlovian age. It is of interest to note that this species occurs sporadically throughout several tens of metres of basal Devon Island beds.

Faunal sample C-79490, which includes the conodont index species *Polygnathoides siluricus*, adds one new item to our knowledge of the stratigraphic range of the *siluricus* Zone in the Canadian Arctic Archipelago. In their 1981 study, Thorsteinsson and Uyeno provided rather strong evidence that the upper contact of the Douro Formation, which is everywhere sharply defined, may represent a time plane and, furthermore, that this contact seems to coincide with the boundary of the *siluricus* and overlying *latialata* zones. Consequently, the discovery of *P. siluricus* in the Devon Island Formation, 36 m above the top of the Douro in section 49, has come as somewhat of a surprise.

There is, as yet, no physical evidence to indicate that the upper contact of the Douro Formation is diachronous, and the presence of *P. siluricus* in sample C-79490 may, therefore, be taken *pro tempore* as establishing a higher stratigraphic range for the *siluricus* Zone in the archipelago than previously known.

Faunal samples C-79490 and C-79431 are also of interest in providing further documentation on the condensed character of Devon Island beds as traced from the southeast to the northwest. The faunas occur near the region of facies

Figure 74. *Section of the upper part of the Douro Formation to the lower part of the Disappointment Bay Formation at Sutherland River in northwestern Devon Island* ***(Prince Alfred Bay)*** [after Thorsteinsson and Uyeno, 1981].

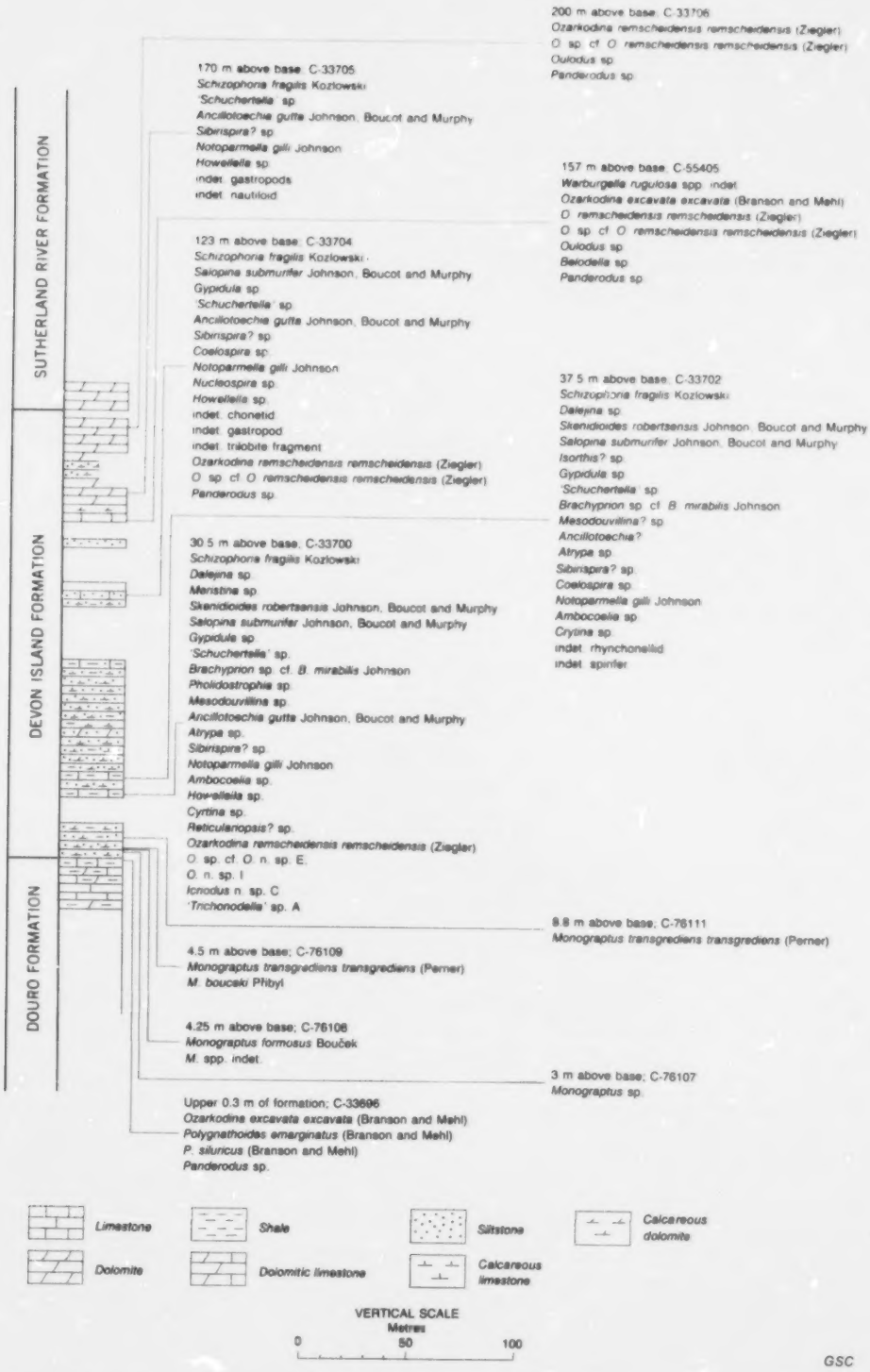


Figure 75. *Section of the upper part of the Douro Formation to lower part of the Sutherland River Formation, about 5 km southeast of Sutherland River in northwestern Devon Island* ***(Prince Alfred Bay)*** *[after Thorsteinsson and Uyeno, 1981].*

change from Devon Island to Barlow Inlet rocks, and they indicate that the basal 39 m or more of the Devon Island in this region is of late Ludlovian age. They are therefore correlative with that part of the basal (4.25 m) beds lacking in diagnostic fossils, below *Monograptus formosus* of early Pridolian age in the section of the formation southeast of Sutherland River, as shown on Figure 74.

Upper Cretaceous to Lower Tertiary

Hassel, Kanguk and Eureka Sound formations

Preserved in a series of northwesterly and northeasterly trending grabens in the *Bear Bay West* map area is a sequence of nonmarine and marine clastic sediments that lies unconformably on various Paleozoic formations. The larger grabens preserving these clastic sediments form outstanding features in the landscape, particularly as viewed from the air (Fig. 76). The grabens have resulted from clastic sediments that are mainly soft weathering and that have tended to form topographic lows. Dark weathering colours characterize them and their typically dark coloured soil is covered with considerable vegetation. These features, therefore, contrast markedly with those of the Paleozoic rocks adjacent to the grabens.

There is paleontological and stratigraphic evidence to indicate that three formations, which are widely distributed in the archipelago, are represented in the clastic sediments of these grabens. They include, in ascending order, the Hassel, Kanguk and Eureka Sound. However, outcrops of the sediments are exceedingly sparse, and rarely exceed a few metres in thickness. Consequently, the stratigraphy of these formations is poorly understood, and it has proved impractical to map them separately.

Hassel Formation

The formation was established by Heywood (1955, 1957) on Ellef Ringnes Island, for exposures consisting mainly of nonmarine sandstone. The basal part of the clastic sediments in the grabens of *Bear Bay West* is ascribed to this formation. It is a unit of sandstone with subordinate interbeds of siltstone and chert-pebble conglomerate. The conglomerate appears to be limited to the lower part of the formation. The sandstone ranges from very fine to mainly coarse grained, and is commonly various shades of yellow and brown. It is, moreover, commonly poorly sorted. The siltstone and very fine to fine grained sandstone are commonly micaceous and carbonaceous, and mostly medium grey in colour. The thickness of the Hassel Formation appears to be roughly 100 m.

Essentially identical microfloras obtained from the Hassel from Stations 64 (C-92751) and 65 (C-92757) have been identified by W.S. Hopkins Jr., and are combined in the following list of species.

Sphagnum spp.
Polyodiacaeae-Dennstaedtiaceae
Laevigatosporites sp.
Cicatricosisporites cf. *perforatus*
Cicatricosisporites sp.
Osmunda spp.
Triplanosporites sp.
Gleicheniidites sp.
Lycopodium sp.
Lycopodiacidites sp.
Deltoidospora sp.
Appendicisporites cf. *cooksonii*
A. cf. *perplexus*
A. cf. *jansonii*
Sestrosporites cf. *pseudoalveolatus*
Glyptostrobus-type
Bisaccate conifer pollen
Inaperturopollenites sp. (?Cupressaceae, ?Taxodiaceae)
Tsuga spp.
Classopollis sp.
Vitreisporites sp.
?Podocarpus sp.
Cycadopites sp.
cf. *Acer* sp.
Tetrad of unidentified angiosperm pollen
Tricolpites sp.
cf. *Castanea* sp.
Syncolpate pollen

According to Hopkins, the species of *Cicatricosisporites*, *Appendicisporites*, *Trilobosporites* and *Sestrosporites* suggest a late Albian or Cenomanian age and, therefore, a correlation with the Hassel Formation. Moreover, he has stated that the "primitive" nature of the angiosperm pollen provides further support for this conclusion.

Kanguk Formation

The Kanguk Formation was named by Souther in 1963 for a unit consisting mainly of silty shale in western Axel Heiberg Island. The Kanguk, in the report area, consists predominantly of a uniform succession of shale that is medium grey to medium dark grey, commonly fissile and locally jarositic. Small ironstone concretions are a relatively common constituent.

On the basis of the sparse outcrops, but more particularly due to frost-riven debris and the characteristics of the soil, it is apparent that the Kanguk Formation is by far the most widely distributed of the Hassel to Eureka Sound successions in the grabens of *Bear Bay West*. A rough estimate of the thickness of the formation is 500 m.

Samples of Kanguk shale collected for microfossil analysis from widely separated exposures of the formation have yielded the following invertebrate faunas:

Station 66

GSC loc. C-92752

Radiolaria
Spongurus (Spongurantha) sp.
Spongodiscus (Spongodiscus) impressus Lipman
S. (S.) sp.
Spongoloncha sp.
Spongostaurus sp.
Stylospongia (Stylotrochiscus) sp.
Crucella sp. cf. *C. plana* Pessagno
Theocorys sp.
Dictyomitra (Dictyomitra) sp. ex gr. *multicostata* Zittel and *striata* Lipman

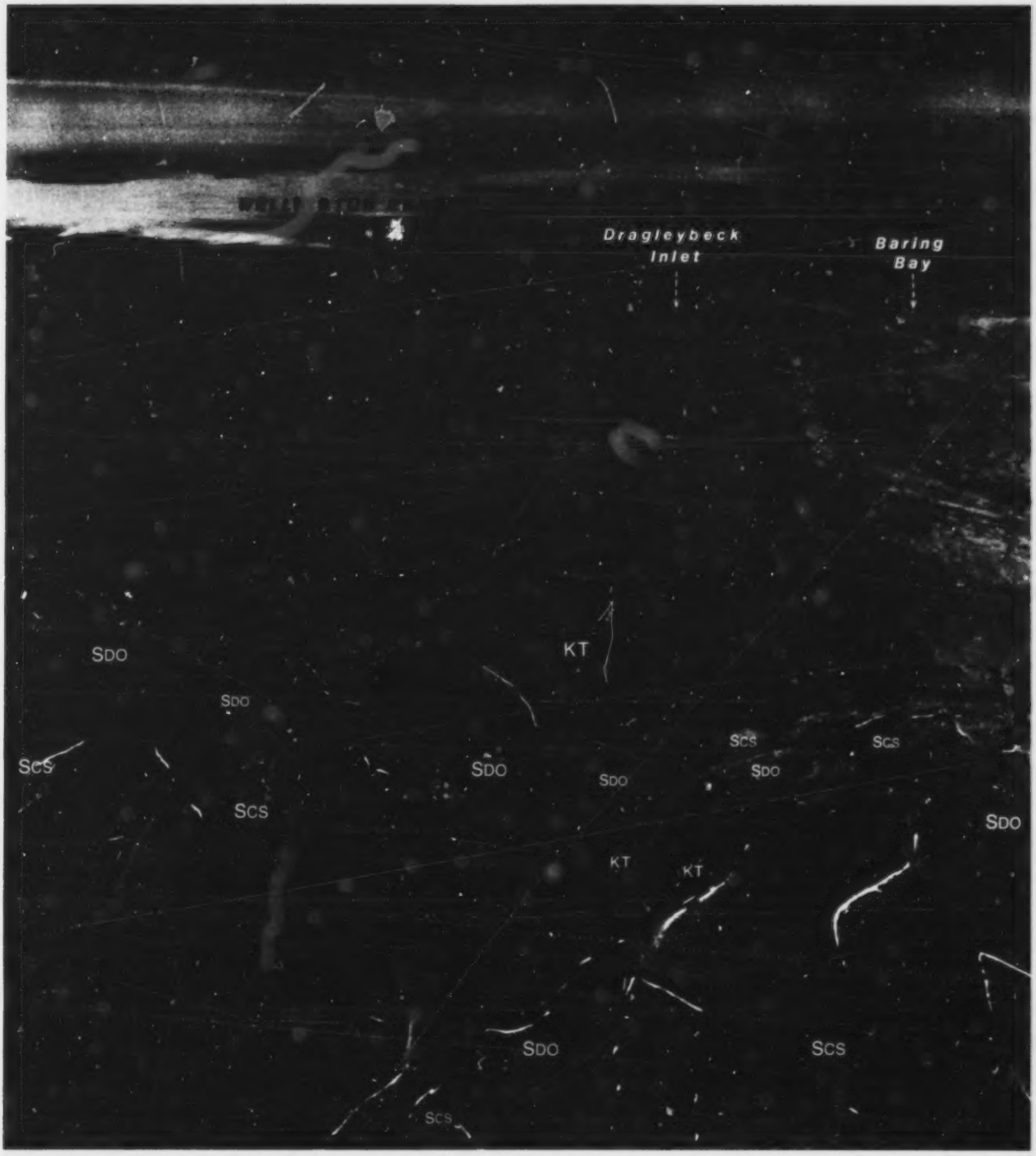


Figure 76. *Oblique aerial photograph (T441L-142) of western Devon Island. View is to the southwest. The photograph illustrates one of several grabens underlain by the Hassel, Kanguk and Eureka Sound formations* (KT) *in this part of the island* (**Bear Bay West**). *The grabens tend to stand out as dark coloured topographic lows in the landscape, because of the weakly consolidated character of these Cretaceous sediments, the prevailing dark grey colour of the Kanguk shale exposed in most of the grabens, and the relatively luxuriant cover of vegetation that characterizes that formation. These characteristics are in marked contrast to the generally barren uplands developed on the more resistant and lighter coloured rocks of the adjacent lower Paleozoic formations. Also note the banded and smoothly rounded contours that characterize the Cape Storm Formation* (SCS). SDO = *Douro Formation;* SDD = *Devon Island Formation;* SDB = *Barlow Inlet Formation.*

Ostracoda
Genus indeterminate - one poorly preserved specimen
Sponges
Various types of siliceous spicules

Station 67

GSC loc. C-92754

Radiolaria (much less common than in C-92752)
Spongurus (Spongurantha) sp.
Stylospongia (Stylotrochiscus) sp., poor preservation
Crucella sp. cf. *C. plana* Pessagno
Foraminifera
?Haplophragmoides sp. - spp. five poorly preserved, reworked (?) specimens
Sponges
Siliceous spicules - rare

Station 68

GSC loc. C-92756

Radiolaria (rare)
Spongurus (Spongurantha) sp.
Spongodiscus (Spongodiscus) sp.

The above identifications are by J.H. Wall (pers. comm., 1980) who comments as follows:

"A considerable diversity of radiolarians was observed in sample C-92752. Although many of these forms are long-ranging, the age of the assemblage is regarded as Late Cretaceous, and post-Turonian. Identical or comparable species listed herein have been reported from the Senonian of Alaska by Bergquist (1966), the Campanian of Siberia by Kozlova and Gorbovetz (1966), and the late Turonian-Coniacian of California by Pessagno (1971). A broadly similar radiolarian fauna has been obtained from the Kanguk Formation in the Sverdrup Basin by the author and also from the mudstone member of this formation on Bylot Island, which was thought to be Campanian-Maastrichtian in age (see Wall, 1978; Miall et al., 1980, p. 5). The single ostracode and rare foraminifera recorded from these samples are very poorly preserved and give the impression of having been severely weathered and/or subjected to reworking.

"The original depositional environment of this siliceous microfauna probably was in relatively deep water, such as on the outer shelf or beyond.

"In summary, the age of C-92752 is probably Santonian or Campanian, and there seems little doubt that this formation is biostratigraphically equivalent to the Kanguk".

Samples C-92752, C-92754 and C-92756 have also yielded abundant dinoflagellate assemblages of nearly identical composition. A combined list of these assemblages is as follows:

Chlamydophorella grossa
C. nyei
Spongodinium delitiense
Palaeoperidinium pyrophorum
Trichodinium castaneum
Odontochitina costata
Palaeohystrichophora infusurioides
Hystrichosphaeridium difficile
Florentinia montelli
Trithyrodinium suspectum
Spiniferites porosus
Exochosphaeridium striolatum
Dorocysta litotes
Spinidinium clavum
Diconodinium arcticum
Dinogymnium sp.
Chatangiella spp.
?Aquilapollenites sp. (pollen)

The identifications were by N.S. Ioannides (pers. comm., 1980), who dated the dinoflagellates as Santonian to Campanian, and stated that they compared closely with those obtained from the lower part of the Kanguk Formation on Bylot Island, as described recently in Miall et al. (1980).

Eureka Sound Formation

As typically developed, this formation consists of a thick and variable assemblage of nonmarine clastic sediments with coal seams, but in places, particularly in its basal part, it contains clastic beds of marine origin. The type section is in western Axel Heiberg Island [Souther, 1963; see West et al. (1975) for a review of the somewhat complicated history of the name Eureka Sound as applied to these rocks].

Fortier's (1963b) description of the Eureka Sound in the graben leading up to the head of Viks Fiord in *Bear Bay West* was the first record of this formation on Devon Island. Moreover, exposures of the formation in *Bear Bay West*, and probably Devon Island as a whole, appear to be limited to this single area. About 200 m of the Eureka Sound, consisting mainly of sandstone, siltstone and shale, are exposed there. Three sections of the formation near the head of Viks Fiord were examined in the course of the present investigations. At Station 52, the formation is represented by nearly 50 m of light coloured, medium grained sandstone with interbeds of coarse grained sandstone and imbricated pebbles (Fig. 77). The sandstone exhibits planar crossbeds with the largest sets about one metre thick; the dominant foredip directions appear to be east and south. About 60 to 70 m of white, fine grained sandstone occur at Station 51. The sandstone is interbedded with thin coal seams, brown siltstone and ferruginous concretions. At Station 76, about 60 m of interbedded, medium dark grey siltstone and shale appear to represent the youngest part of the formation exposed in the valley south of Viks Fiord.

A sample from the section at Station 51 (C-77159) yielded well preserved palynomorphs that included the following genera: *Laevigatosporites*, *Sphagnum*, *Lycopodiacites*, *Osmunda*, *Zlivisporis*, *Glyptostrobos*, *Azonia*, *Aquilapollenites*, *Extratriporopollenites*, *Wodehouseia*, *Expressipollis*, *Triporopollenites*, *Tricolpites* and *Kurtzipites*. The identifications were by W.S. Hopkins, Jr. (pers. comm., 1980), who stated that the assemblage was early Maastrichtian in age.

The Eureka Sound Formation represents the youngest formation in the Sverdrup Basin that includes an essentially conformable succession of rocks ranging from Early Carboniferous to Early Tertiary in age (see Figure 4). The formation is markedly transgressive, and outcrops far beyond

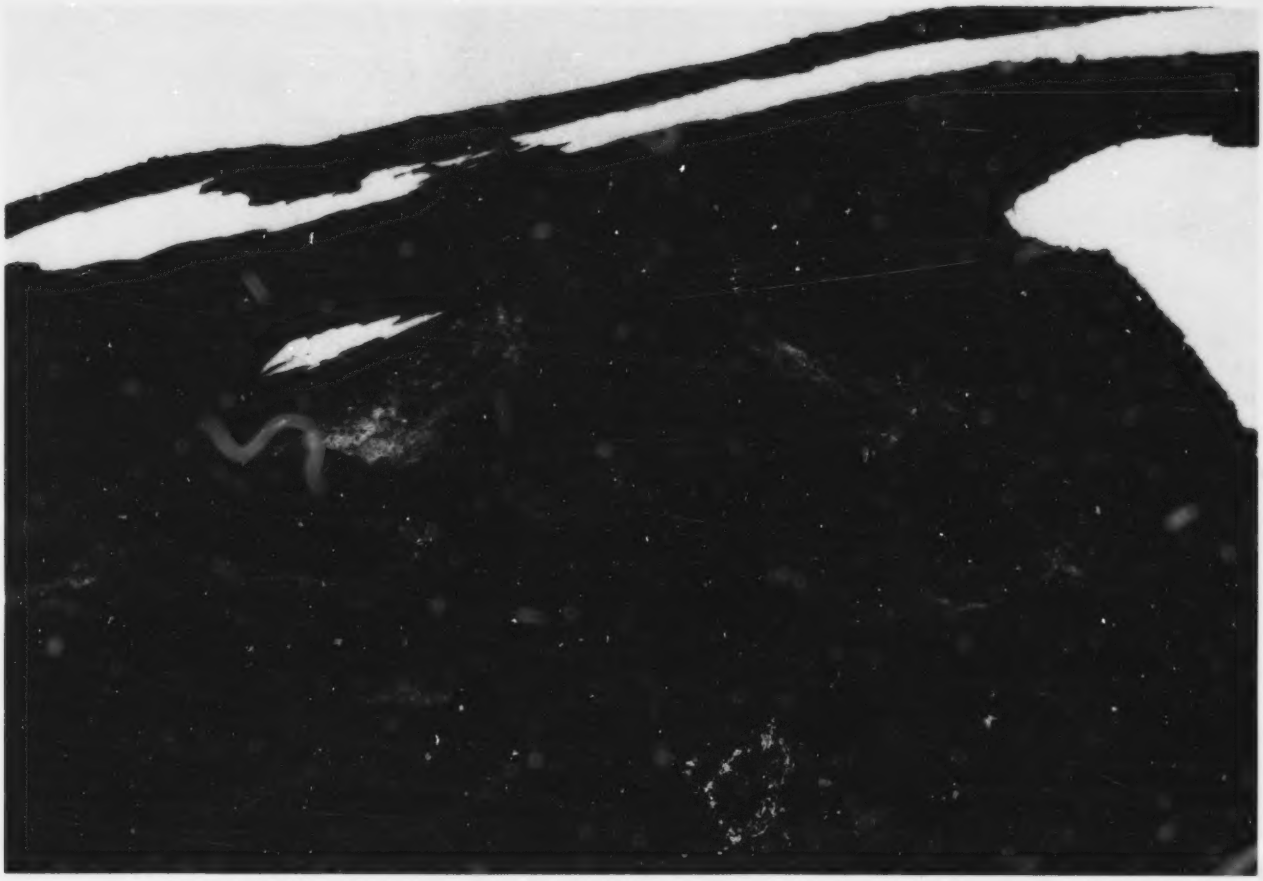


Figure 77. *Eureka Sound Formation at Viks Fiord on the north coast of Devon Island (Station 52,* ***Bear Bay West****). Here, about 50 m of unconsolidated, crossbedded sand are exposed. The sand is downfaulted against thin bedded, carbonate rocks of the Cape Storm Formation in background. Note man at base of outcrop for scale.*

the limits of the Sverdrup Basin, to the extent that it constitutes the most widely distributed rock unit in the archipelago. Moreover, the Eureka Sound sediments are the youngest deposited in the archipelago before the Eurekan Orogeny, which affected Axel Heiberg Island and nearly all of Ellesmere Island. The maximum age span of the Eureka Sound is Maastrichtian to Middle Eocene (West et al., 1975), but, because the upper contact of the formation is everywhere marked by an unconformity or the present day erosion surface, the original upper age limit is not known. The formation is, nevertheless, clearly older than Miocene because the Beaufort Formation, which is Miocene in age, (Hills et al., 1974) overlies Eureka Sound beds in widely separated parts of the archipelago (Meneley et al., 1975; Bustin, 1977; Miall, 1979). Although Eureka Sound beds of Paleocene and Eocene ages have not been demonstrated to occur on Devon Island, it seems reasonable to assume that beds of these ages are either present, or were at one time present, and have since been removed by erosion.

Upper Tertiary

Impact breccia[1]

Distribution

Polymict impact breccia, lying unconformably on lower Paleozoic rocks, outcrops over about a quarter of the area of the Haughton crater (*Bear Bay West*). The breccia is distributed mainly over an area of some 56 km^2 near the approximate centre of the crater. Several small outliers of breccia occur between this central area and the crater's rim (Fig. 78).

[1] This rock unit has been described previously by Frisch and Thorsteinsson (1978), and the description presented herein is taken more or less verbatim from their account. For a fuller description of the rock unit, the reader is referred to Frisch and Thorsteinsson (*op. cit.*).

Figure 78. *Oblique aerial photograph (T438L-144) showing the Haughton Crater in middle ground. View is to the west across a prominent unnamed lake that is situated about 7 km southwest of the head of Thomas Lee Inlet on the north coast of Devon Island (**Bear Bay West**). The crater is about 16 km in diameter. The light coloured terrane that characterizes much of the centre of the crater marks the distribution of the impact breccia. Five small outliers of the breccia are also discernible to the east and north of the main outcrops. Excellent sections of the resistant Thumb Mountain and soft-weathering Irene Bay formations* (OCTI) *rim the uplands in the vicinity of the lake, and overlie the much thicker, recessive weathering Bay Fiord Formation* (OCB). OSA = *Allen Bay Formation.*

Lithology and thickness

The breccia consists mainly of dolomite and limestone, but it includes various other kinds of sedimentary rocks and a relatively small amount of materials derived from the Precambrian basement. The components range in size from the finest grains to boulders. Although clasts of Precambrian metamorphic rocks occur throughout the areal extent of the breccia, they are rare indeed outside a limited area, north and east of the crater's centre, where clasts of these rocks are not only numerous, but also larger (up to 3.5 m in diameter) than elsewhere in the deposit. Outside this area, clasts are seldom larger than cobble size.

On casual inspection, most hand specimens of breccia appear to consist only of very light to dark grey granules and pebbles embedded in a very light grey matrix. The matrix consists predominantly of loosely bound, granular carbonate rock, studded with angular fragments of basement rocks and minerals, of which the most common are feldspar and quartz with planar elements. Most of the sedimentary clasts are very finely granular, carbonate rocks that are either much lighter or darker shades of grey than any of the lower Paleozoic rocks penetrated by the impacting body, and are clearly altered. However, many carbonate clasts appear to be entirely unshocked, and at any given outcrop it is commonly possible, on the basis of lithological and/or faunal characteristics, to identify some as having been derived from one or the other rock unit that occurs between the Precambrian basement and the stratigraphic level of the crater. Some of the shocked carbonate clasts show intense microtwinning in thin section. Clasts of basement rocks are commonly shock-metamorphosed to varying degrees.

The principal weathering colour of the impact breccia is very light grey but, as viewed from a distance, the formation exhibits a distinctive bluish grey colour that contrasts markedly with the generally sombre weathering colours of the underlying Paleozoic formations. The breccia is poorly consolidated and outcrops are generally scarce. The best exposures occur in a series of bluffs developed along the

eastern boundary of the main occurrence, and which overlook the alluvium-filled valley of Haughton River; and it is here that the breccia attains its greatest thickness of about 90 m (Station 69, *Bear Bay West*). Moreover, these exposures demonstrate the fact that the breccia is lithologically similar from bottom to top. The breccia is notably porous, and it is crudely bedded and jointed. Shatter cones are ubiquitous and especially well displayed in some of the darker coloured, limestone cobbles and boulders that were presumably derived from the Eleanor River Formation.

Lake sediments [1]

Distribution and thickness

Lake sediments, represented by a single patch of flat-lying exposures some 15 km^2 in area, occur within the Haughton crater, near its western rim. Although the basal contact of the lake sediments is nowhere exposed, the sediments appear to overlie partly the deformed lower Paleozoic rocks and partly the impact breccia. The present day erosion surface marks the top of the lake sediments, which have a maximum thickness of about 28 m. Outcrops of the sediments are rare with none exceeding about 3 m in thickness.

Lithology

The dominant lithology of the lake sediments is dolomite silt, lesser amounts of fine grained dolomite sand, and a small admixture of calcite and quartz particles. The sediments are thinly and evenly bedded, and vary in colour from very light grey to pale yellowish brown. They are unconsolidated, except for a few, interbedded, concretionary layers, up to about 10 cm thick, which consist of medium light grey limestone near the middle of the unit; and dusky red, dolomitic sandstone and dusky red ironstone in stratigraphically higher parts of the unit.

Age

The lake sediments are interpreted as an infilling of the crater that occurred shortly after the time of impact. On the basis of this assumption, the age of the impacting event and impact breccia may be considered as about the same as that of the lake sediments.

The age of the lake sediments was given in Frisch and Thorsteinsson (1978) as Miocene or Pliocene, on the basis of microfloras and ostracodes obtained from the sediments. A somewhat more restricted age determination is now available from vertebrate fossils (C-63570), discovered in the lake sediments by Frisch and Thorsteinsson in 1976, and augmented by further collections made in 1979 and 1982 by R.M. West and M.R. Dawson. R.M. West (*in litteris*, 1982) comments as follows: "The fauna includes a leporid, shrew, tragulid and a rhinoceros. The leporid and shrew are primitive forms, suggesting an Oligocene or Early Miocene level of evolution. The tragulid, on the other hand, is highly specialized, and is closest morphologically to a Middle Miocene species of *Dorcatherium* from Germany. The rhinoceros is less readily datable, but appears to be at a Miocene stage of evolution. Dr. Dawson's and my preliminary estimate of the age of the fauna is Early or Middle Miocene. None of the taxa is suggestive of a Pliocene age".

[1]The lake sediments have been described previously by Frisch and Thorsteinsson (1978), and the description of the sediments presented herein is taken from that report. It should be noted, however, that the thickness of 60 m, given as the thickness of the lake sediments by these authors, is now regarded as an error.

CHAPTER IV

INTERPRETATION OF FORMATIONS

Introduction

This chapter is divided into three segments, broadly reflecting the different terrigenous and carbonate sequences encountered in the project area. The first segment deals with the Strathcona Sound and Rabbit Point formations which, with the exception of the carbonate unit of the former, are composed of terrigenous material. The second segment treats the lower Paleozoic formations that consist predominantly of carbonate rocks. The guiding concepts and terminology are set out at the beginning of that segment, because they apply universally to all formations of that segment and thus permit grouping of units into broad environmental categories. The third segment is a brief discussion of three additional terrigenous units, the Hassel, Kanguk and Eureka Sound formations.

Strathcona Sound and Rabbit Point formations

Strathcona Sound Formation

The carbonate unit probably was deposited in an intertidal or supratidal environment; the main evidence being the presence of lamination and bird's-eye textures. The breccia pods are interpreted as broken tepee structures, as described by Assereto and Kendall (1977). Stratigraphic information for the carbonate unit on Borden Peninsula (Jackson et al., 1978) indicates the presence there of a shallow subtidal to intertidal carbonate platform with bioherms. The carbonates at location 16 are probably the northwestward continuation of that carbonate platform.

The grey and red siltstone units, except for rare ripple marks and broad, shallow, trough crossbeds, lack features characteristic of shallow water. Possible environments of deposition are prodelta for the shales and delta slope for the siltstone and the very fine grained sandstone. This interpretation also takes into account the total absence of fluvial or tidal features and is compatible with regional interpretations on Borden Peninsula to the southwest. Geldsetzer (1973) considered the Strathcona Sound Formation to be part of a fluviodeltaic wedge with a source area in the west. On southern Devon Island, a northern lobe of that delta complex could conceivably have been present.

Rabbit Point Formation

Because of the uncertain correlation between the various exposures of the Rabbit Point Formation, an interpretation of this unit is somewhat speculative. The thin bedded, burrowed sandstone is of shallow (subtidal, above wave base) marine origin, whereas the light coloured, unfossiliferous sandstone containing large crossbeds may be fluvial sediment. What is seen now is probably an incomplete record of a shifting Early Cambrian system of rivers, beaches, and shallow offshore areas that eventually covered the subdued topography of the Proterozoic basement.

Lower Paleozoic carbonate formations (Bear Point to Sophia Lake Formation)

Concepts, terminology and significance of sedimentary features – regional considerations

There are two different basic shapes for epeirogenic carbonate bodies, the carbonate ramp and the carbonate platform (Wilson, 1975). Ramps slope gently into the basin and the carbonates interfinger gradually with the basinal shales. Carbonate platforms have a more or less horizontal upper surface with a sharp drop toward the basin. Both types of configurations can be applied in the interpretation of the lower Paleozoic carbonate sequence. All units from the Bear Point to the Eleanor River Formation appear to be ramp deposits, whereas the middle Allen Bay Formation and higher units (Silurian) were formed on a carbonate platform. The Bay Fiord, Thumb Mountain, Irene Bay and lower Allen Bay formations appear to be deposits of an intermediate carbonate shelf. No comprehensive work on the regional geology has yet been published that supports bifold classification of depositional geometry for the entire lower Paleozoic stratigraphic column, but a number of publications, of local scope, as well as unpublished observations by one of the authors (Thorsteinsson), support bifold classification as a workable hypothesis.

The ramp to basin boundary zone for the Cambrian-Ordovician rocks has been investigated only in a reconnaissance fashion on northern Ellesmere Island. Kerr (1968) reported an apparent gradual increase of shaly rocks in the Cornwallis Group in a northwesterly direction; Trettin (1976) and Trettin et al. (1979) traced the Ordovician and earliest Silurian rocks of the Franklinian shelf into the basinal Hazen Formation without encountering a sharp margin of shallow water rocks. Later work (Trettin, pers. comm., 1982; Trettin et al., 1982) showed the presence of shallow water carbonates along the shelf edge for the Bay Fiord and Thumb Mountain formations. Morrow and Kerr (1977) likewise described shallow water carbonates in the Thumb Mountain Formation on Grinnell Peninsula, at the seaward side of the shelf. Tozer and Thorsteinsson (1964) examined the equivalent facies change on Melville Island and reported on its gradational nature. On Svendsen Peninsula, Mayr (1973) noted a gradational facies change between the Cape Phillips Formation and rocks equivalent to the lower unit of the Allen Bay Formation.

A sharp platform margin with reefoidal buildups of Silurian age is known from Cornwallis Island (Sodero and Hobson, 1979, Allen Bay Formation; Thorsteinsson, 1958, Barlow Inlet Formation). On Ellesmere Island, a very abrupt Silurian facies change is present in the subsurface of Bjorne Peninsula (Mayr et al., 1978) and a reefoidal platform edge has been described from Svendsen Peninsula (Mayr, 1973; McGill, 1974; Poey, 1982).

Definition of terms

Four categories of carbonate environment are used in the present interpretation: subtidal, subdivided into below

wave base (deep) and above wave base (shallow), intertidal and supratidal. Definition of these terms is based on the concept of the exposure index (Ginsburg et al., 1977).

A fundamental problem in interpreting the record of an epeiric sea is the regional uniformity of relatively thin carbonate units deposited in a shallow (frequently peritidal) environment. In the project area, the uniformly developed Cambro-Ordovician formations must be discussed within the context of a carbonate shelf at least 500 km wide. Most of the seaward (northwestern) edge is hidden under the Sverdrup Basin and, toward the southeast, the shelf must have extended beyond Brodeur Peninsula.

If a sedimentation mechanism based on diurnal tides is assumed, then tidal currents in excess of 100 km/h must have swept across the Cambro-Ordovician shelf at some stage. Such an idea is considered absurd because of the absence of deep scours, coarse clastic sediments and other features caused by extreme water turbulence. This is an old problem and one solution has been given by Shaw (1964). He postulated that all epeiric, marine, sedimentary rock units are inherently diachronous and formed by seaward accretion. They should thus conform to Walther's principle of facies distribution. "Time markers" are thought of as units which accreted so fast that diachronism cannot be recognized by paleontological methods (Wilson, 1975, p. 54). Use of the concept of the exposure index for interpretation provides an alternate explanation for extensive shallow water carbonate units, though it does not necessarily exclude the assumption of intrinsic diachronism on a regional scale. It does, however, make it possible to consider the stratigraphic units of the present map areas as nondiachronous. This is compatible with the paleontological evidence and the generally abrupt formation boundaries.

According to Ginsburg et al., (1977) the exposure index of any one point on the tidal flat surface is the mean annual percentage of time that point is exposed. Ginsburg et al.'s (1977) work is based on extensive observations in the tidal flats of Andros Island in the Bahamas. Areas with an exposure index of less than 25 per cent fall below mean low water level and sediments interpreted as having been derived from below a similar water level are termed subtidal in the present report; areas with an exposure index between 25 per cent and 85 per cent annual exposure fall between mean low and mean high water levels and are herein considered to form the intertidal environment. Finally, areas with an exposure time of more than 85 per cent during the year are considered to be the supratidal environment. The great advantage of a definition based on an annual exposure index is that, besides diurnal tides, fluctuations of water level caused by other factors can be included in the sedimentary mechanisms. Seasonal effects, including persistent winds and rain, have a strong influence on the exposure index (Hardie and Garret, 1977), causing some areas to be inundated during the summer and to be exposed during the winter. In a geological context, it may even be possible that climatic changes over periods of years cause variations in water levels that may simulate an intertidal environment. In this manner, the terms sub-, inter- and supra-tidal are used to describe seasonal or possibly longer periodic changes in water level. If these seasonal or longer-range, mainly climatic controls on sedimentation are assumed, it is possible to have simultaneous, uniform inter- and supra-tidal sedimentation over a shelf stretching for hundreds of kilometres. Rock units then represent time stratigraphic units, and they do not have to be considered as diachronous units whose time range is beyond biostratigraphic resolution.

The subtidal environment has two subdivisions, shallow and deep. The shallow subtidal environment ranges from areas with an exposure index of 25 per cent to wave base; deep subtidal is below wave base, but above the bathyal zone. The depth of wave base is dependent on hydrographic and meteorological conditions. The carbonate ramp, in existence from Middle Cambrian to Ordovician time, would have been covered by a wide, open ocean, thus large distances for fetch were provided, and there was no hindrance for swells. Paleomagnetic extrapolation places the Arctic Archipelago during Ordovician and Silurian time between latitudes of 10° and 30°N (Irving, 1973; Habicht, 1979), a zone that presently is tropical. The tropical air mass zone is characterized by trade winds, monsoons, and tropical cyclones, such as hurricanes and typhoons. The Pacific Ocean off the Oregon coast, at the northern edge of the present tropical air mass, may be analogous to the Ordovician "ramp ocean". There, normal wave action may reach as deep as 50 to 100 m, and during winter storms sedimentation can be affected to depths of 200 m (Seibold, 1974). In this report, a depth of wave base of about 50 m is assumed for the carbonate ramp. This value is in agreement with Read's (1980) depth estimate for Ordovician deep ramp facies in the Appalachians.

Wave base on the carbonate platform is at considerably shallower depth. The surface of the platform is broken by shoals, thus allowing only relatively short stretches of fetch, and most of the energy of oceanic swells from the basin is dissipated along the platform margin. In the Bahamas-Florida area, a carbonate platform in the trade wind region, wave base does not exceed a depth of 10 m (Flügel, 1978). A similar value is assumed for the Silurian carbonate platform of Devon Island.

Significance of lithological features

A restriction to four categories of carbonate environments leads necessarily to generalization; matters are additionally complicated by the fact that entire stratigraphic units may be "assigned" to a single category. Thus, although the environment of most of the formations or lithofacies is as described in Table 3, this interpretation does not negate the possibility that some intervals, representing other environments, may also be present. This approach appears justified because the units are defined by lithological and sedimentological characteristics and are generally very uniform vertically and laterally. It is hoped that with a generalized approach, a clearer picture of the regional changes through time will emerge. Interpretation of the plethora of subenvironments will have to wait until further fieldwork provides detailed lithological data. To provide consistency and to avoid repetition in the discussion of formations, the significance of their most common lithological features, as listed in Table 3, is discussed below. Unless specific references are given, the comments are based mostly on Wilson (1975), Flügel (1978) and Hardie (1977).

1. Texture. The first column of Table 3 marks the presence of grainstone and rudstone, rocks characterized by grain-supported texture or absence of mud matrix. These features are to a large degree dependent on kinetic energy during deposition; such rocks are considered to belong to the categories Plumley et al. (1962) termed "moderately" and "strongly agitated". The turbulent currents controlling deposition are caused by diurnal tides and wind, in addition to wave oscillation. In the present study, no attempt has been made to distinguish those factors and the presence of grainstone or rudstone is taken to indicate deposition at or above wave base.

2. Bedding. Absolute values used in this report to define bedding thickness are tabulated as follows:

Thickness	Bedding
<0.3 cm	thinly laminated
0.3 - 1.0 cm	laminated
1.0 - 3.0 cm	very thin bedded
3.0 - 10 cm	thin bedded
10 - 30 cm	medium bedded
30 - 100 cm	thick bedded
>100 cm	very thick bedded, nonbedded

Medium and thick bedded rocks indicate either slow, steady sedimentation in a stable environment, or, if they are coarser grained, a rapid rate of sedimentation. Also, bioturbation can destroy originally thinner beds and create apparently thick beds. Thin and very thin beds seem to indicate frequent change in depositional conditions and are common in peritidal environments. On Andros Island, they are found most commonly in the supratidal inland algal marsh. Planar, parallel lamination is found mostly in two environments, either in the supratidal environment where algal films trap sediment brought in during storms (Hardy and Ginsburg, 1977) or on deep, subtidal slopes. Planar lamination should also be found in protected pools of a restricted platform, where highly saline water inhibits animal life and, therefore, burrowing of the sediment. A statistical study by Lumsden (1971) appeared to indicate that for carbonates, bedding thickness and facies are unrelated; however, in that study only medium and thicker bedding were considered.

3. Internal inorganic structures. Intraformational, flat-pebble conglomerate has long been regarded as a tidal channel deposit (Braun and Friedman, 1969). On Andros Island (Ginsburg et al., 1977), it is present in a number of high intertidal and supratidal subenvironments with an exposure index of 60 per cent and higher, and is the result of both normal and catastrophic sedimentary processes. Desiccation cracks are present in both the inter- and supra-tidal environments but may be more common in the intertidal region. Some nodular limestone, although its actual diagenesis is not clear, is considered to be of deep water origin (see Flügel, 1978, p. 395 for references). Depth estimates range from 4000 m to 300 m, with a slow sedimentation rate of a few millimetres for every thousand years. Other nodular limestone is the result of diagenetically modified flaser or lenticular bedding. Both varieties are of subtidal origin. Crosslamination is formed by bottom currents and considered to be a sedimentary feature of subtidal, below wave base, origin.

4. Algal features. "Smooth domal lamination" of Hardie and Ginsburg (1977) appears to be the closest recent analogue to the non-planar lamination encountered during the present investigation. In the Bahamas, these features are present mainly in the intertidal range. Bird's-eye structures also appear to be more common in the intertidal range. The value of stromatolites as depth indicators is dubious. Although undoubtedly more abundant in shallow subtidal and intertidal environments, they have been reported from rocks deposited at a depth of 100 m or more (Playford et al., 1976). Of coralline algae, only dasycladaceans in the upper Thumb Mountain and lower Allen Bay formations, and codiaceans in the Sophia Lake Formation were found. Recent forms of both orders are widespread in the shallow subtidal environment, although codiaceans may reach a depth of almost 100 m. Maximum depth for recent dasycladaceans is about 25 m (Wray, 1977).

5. Trace fossils. Two types of trace fossils are prevalent in the sequence under discussion: (1) burrows which form the labyrinthine mottling that is characteristic of many Ordovician limestones; and (2) horizontal trails like *Planolites*, *Chondrites* and *Paleophycus*. The low diversity of the trace fossils encountered in the Ordovician rocks implies shallow subtidal conditions; the Silurian formations contain a greater variety and could be of slightly deeper origin (Pickerill and Forbes, 1979). Because of the uncertain significance of trace fossils, they are considered to be only marginally important.

6. Features related to salinity. Seams of laminated anhydrite and gypsiferous shale within carbonate sequences indicate restricted conditions during sedimentation similar to those for evaporite solution breccias. Trettin (1969, p. 47) listed some of the diagnostic features of evaporite solution breccias. Synaeresis cracks indicate large increases in salinity (Jüngst, 1934; Burst, 1965) and, in several instances during the present fieldwork, impressions of halite crystals were found together with synaeresis cracks. Differentiation of synaeresis cracks from desiccation cracks is difficult (Plummer and Gostin, 1981). Generally, it was assumed that simpler forms (i.e. single generation or incomplete cracks), were synaeresis cracks. However, making the distinction is often a subjective act and probably influenced by other sedimentary features exposed in the vicinity. The term "patterned carbonate" was formally introduced by Dixon (1976), who pointed out that patterned carbonates are associated with sulfate deposition.

Discussion of formations

Bear Point Formation

The lower and middle members of the Bear Point Formation are dominated by shale and nodular limestone. The proportion of nodules decreases upward and westward and appears to have been controlled by the quantity of clay in the original sediment (Jenkyns, 1975). The nodular limestone grades into massive, mottled carbonates of the upper unit. The members were deposited in a deep subtidal environment, with the sedimentation ratio of clay to carbonate much higher in the shaly and nodular units.

Deep water origin for nodular limestone, postulated mainly by European researchers (see Flügel, 1978, p. 395 for references) is compatible with the evidence obtained on Devon Island. The limestone consists of low energy lime mudstone and skeletal wackestone. Shallow water features are absent. If the assumptions in the introductory statement are correct, this rock was deposited on a carbonate ramp at a depth of more than 50 m. A depth of several thousands of metres appears to be unlikely, as the area of sedimentation is a stable shelf, but subsidence of several hundreds of metres appears feasible. Subsidence after deposition of the shallow marine and fluvial Rabbit Point Formation must have been sudden. There are only rare, transgressive, sandy sediments (probably reworked Rabbit Point Formation) in the lower part of the upper dolomite member in the western exposures;

TABLE 3. Interpretation of formations

STRATIGRAPHIC UNITS		LITHOFACIES	TEXT.	BEDDING				INTERNAL INORGANIC STRUCTURES				ALGAL FEATURES				TRACE-FOSSILS		FEATURES RELATED TO SALINITY				FOSSILS										ENVIRONMENT				RELATIVE WATER DEPTH OF STRATIGRAPHIC UNIT	CONFIGURATION OF SHELF	NOTES ON FORMATIONAL AND MEMBER CONTACTS
																						PLANKTONIC NEKTONIC			BENTHIC								DEPOSITIONAL FACIES				SALINITY			
FORMATION	MEMBER		Grain-, rudstone	thick to massive	medium bedded	thin- to very thin-bedded	planar lamination	intraformational conglomerate	desiccation cracks	nodular bedding	cm to lamination	wavy lamination	birdseye structures	stromatolites	coralline algae	burrows (labyrinthic mottles)	horizontal trails	evaporites	evaporite solution breccia	synaresis cracks	patterned carbonates	gryphitites	cephalopods	corals	bulb or lemnisk. stromatoporoids lobular	crinoids	brachiopods	bryozoans	ostracodes	gastropods	sponge spicules	bioherms	subtidal, below wavebase	subtidal, above wavebase	intertidal	supratidal	open	restricted	Wavebase, ramp / 50m / Wavebase, platform / 10m / Mean tide level / 0m		
SOPHIA LAKE		dolomite and limestone	R		C	C	C	C	C				C		C	C		C										C				C			C		Platform	
DEVON ISLAND		argillaceous limestone	C			C										C										R			R		C				C		Clino-form	
BARLOW INLET	*upper*	lime mudstone	R	C				C		C						R							C	C	C	C	C			C	C				C			
		limestone and dolomite	C			C	C		C		C			C	R					C								C	C				C	C		C			conformable contact
	lower	shale					?																								C				C			conformable contact
DOURO		mud mounds		C																			R		R						C				C			
		lime mudstone		C	C					C						C	C														C				C			gradational contact
		skeletal packstone and rudstone	C	C																		C	C		C	C			C			C			C			actual contact not observed
CAPE STORM		dolomite and limestone	C			C				R	C												R	R	R		R		R	R				C	C		C		
ALLEN BAY	*upper*	laminated to thin bedded dolomite				C	C				R	R		C					C		R													C	?		C		discontinuity (minor erosion of lower member)
		thin- to thick-bedded carbonate	C	C	C	C								C		R	R					R		R								C			C			discontinuity (prominent hardground)
	middle	dark coloured dolomite	C	C	R	R																	C	C	C		C			C		C			C			discontinuity (partial erosion of upper Bay Fiord Formation)
		light coloured dolomite			C	C		R				C		C				?	C	?	R												C				C		actual contact not observed
	lower	lime mudstone and wackestone		C						R					C	C							C		C			C	R	C	C				C			conformable contact
IRENE BAY		lime mudstone and wackestone			C	C				C													C	C	C	C	C		C			?			C			conformable contact
THUMB MOUNTAIN	*upper*	lime mudstone and wackestone		C											C	C							C		C	C	C		C		C	R			C			conformable contact
	lower	dolomite and lime mudstone		C	C	R				R						C					R										C				C	?		discontinuity (partial erosion of upper Bay Fiord Formation)
BAY FIORD	*D*	dolomite				C																									?				?			actual contact not observed
	C	dolomite and limestone		C	C											C							C		C	C	C		C		C				C			conformable contact
	B	shaly and silty dolomite				C		C										C		C											C		C					conformable contact
	A	anhydrite and dolomite	C				C			C			C	R				C	C												C				C			conformable contact
ELEANOR RIVER	*D*	limestone and dolomite	C			C	C							C		R					R											C				C			conformable contact
	C	lime mudstone	R	C	C									R		C									C	C					C	R			C			conformable contact
	B	lime mudstone	C			C	C	R	C			C	C	C				C	R		R												C			C			conformable contact
	A	lime mudstone	R	C				R								C						C	C						C			C				C			discontinuity surface observed at locality 27 (Section 2)
BLAMEY BAY	*upper*	dolomite and sandstone	C		C	C		R	C									C	C														C			C			discontinuity (?) some basal conglomerate
	lower	dolomite	?		C	C	C	C						R			R															C	R			C			no direct field evidence for disconformity or discontinuity
CAPE CLAY		dolomite and lime mudstone	?	C										R		C						C									C				C		Carbonate ramp	
CASS FJORD	*D*	dolomite	C	R		C	C	C								R									R				R				C	C	?			
	C upper	dolomite, shale and sandstone				C	C																											C		?			
	C middle	sandstone and carbonate	C		C	C																													C	?			
	C lower	dolomite			C	C			C																								C	C		?			
	B	shale					C	R	R					C			C													C	C					C			
	A	dolomite and flat-pebble conglomerate	R			C		C	C					R			C			C														C			C			
BEAR POINT		dolomite	R	C				R		R						C															C	R			C			disconformity (partial erosion of upper Bear Point Formation)
	l and m	lime mudstone and shale			R	C				C						R									C						C				C			

C - Common or abundant R - Rare

GSC

elsewhere, the shaly limestone and shale rest directly on the sandstone of the Rabbit Point Formation. Fine, terrigenous sediment was added from the east and interacted with the carbonate to form the nodular limestone but, in later stages, during deposition of the upper member, only relatively pure carbonate "dust" settled out on the bottom of the Bear Point ocean. Because of the slow sedimentation rate, the sediment was reworked by burrowing organisms into a homogeneous mass. Toward the end of "Bear Point time", water shallowed to a depth where storms may have had, at times, some effect and the resultant large waves produced some winnowed sediment.

The massive facies of the upper member is a dolomitized form of the labyrinthine mottled limestone that forms a number of Ordovician units, for example Cape Clay Formation or the upper part of the Thumb Mountain Formation. Dolomitization occurred in at least two stages: firstly, a penecontemporaneous or later, but still relatively early, dolomitization of sedimentary structures, mostly burrows (Kendall, 1977; Morrow, 1978); and secondly, late diagenetic dolomitization of the entire rock, possibly in connection with the disconformity between the Bear Point and Cass Fjord formations. Dolomitization was restricted to the less argillaceous, porous carbonate units. The shaly intervals of the nodular limestone formed effective barriers for the dolomitizing solutions.

The authigenic feldspar in the Bear Point Formation has probably no environmental significance. Braun and Friedman (1969) assumed that the presence of authigenic feldspar indicates hypersaline brines and a humid climate, but investigations by Kastner and Siever (1979) showed that normal marine seawater during early diagenesis carries sufficient K- and Na- ions for the formation of feldspars. Alternatively, during late diagenetic stages, alkali elements may have been leached by meteoric waters from overlying evaporitic units of the Blanley Bay or Bay Fiord formations and were released into the Bear Point Formation.

Cass Fjord Formation

Characteristic sedimentary structures of member A of the Cass Fjord Formation are flat-pebble conglomerate and regular, thin bedding. Of less common occurrence are flaser and ripple crossbedding and desiccation cracks. These features place the unit in a high intertidal to supratidal environment.

The significant features of member B are its thinly laminated shale with gypsiferous laminae, stromatolitic bioherms, a general paucity of flat-pebble conglomerate, or other features of shallow or turbulent water. Laminites have been interpreted variously as supratidal algal mats or as subaqueous sediments in basins having little or no water circulation (Davies and Ludlam, 1973). The latter interpretation is favoured for this member because of the apparent absence of desiccation cracks throughout the member. Some stromatolite mounds in locations 18 and 24 show evidence of possible exposure and may have been periodically emergent. Wave base in this particular case is assumed to have been very shallow, perhaps as a response to particular climatic conditions. The sedimentary relief around the stromatolite bioherms in location 24 indicates a water depth of approximately one metre.

Member C of the Cass Fjord Formation is considered to be a regressive-transgressive shoreline sequence. The sandy-silty dolomites of the lower part of the unit are the record of subtidal and intertidal foreshore sediments, which then grade upward into the thick sands of an ancient shoreline which moved westward. Source of the sands was presumably the Precambrian Shield to the east. At section 3, the sands are relatively thick and pure, whereas farther west, as exemplified in section 24, the sands are much thinner, interbedded with carbonates, and interfinger with offshore sediments. The upper part of member C indicates a waning of sand supply and transgression of an intertidal sequence over the supratidal beach sands.

The lithology of member D is similar to that of member A and is interpreted as the record of a similar, high intertidal or supratidal environment.

Cape Clay Formation

The Cape Clay Formation consists of massive, burrowed limestone and dolomite with pelagic cephalopods. The character of the rocks is the same as that of the upper unit of the Bear Point Formation. The Cape Clay Formation is interpreted to be of similar deep, subtidal origin.

Blanley Bay Formation

The Blanley Bay Formation is a shallow water deposit. The lower member consists of thin to thick bedded, internally laminated dolomite with possible grainstone "ghost" textures. The dolomite is interbedded with rare, flat-pebble conglomerate and thin bedded, very fine grained sandstone. There is no evidence of subaerial exposure and ripple marks are rare. This combination of thin bedding and less common shallow water features indicates a mainly subtidal environment. Thin, planar bedding and fine grained sediments are characteristic of foreshore and shoreface sediments (Reineck and Singh, 1973). In examples from recent sediments (Reineck and Singh, 1971), shoreface sediments are extremely bioturbated, with the amount of burrowing decreasing in shallower water. The lack of bioturbation in the member may thus be indicative of shallow deposition.

The upper member of the Blanley Bay Formation appears to be of shallower water depth than the lower member. The member consists of medium and coarse grained sandstone interbedded with dolomite. Both lithologies are mainly thin bedded. Crossbeds and desiccation cracks are present in the northern area where the sandstone is exposed but, in the type section, uniform planar bedding predominates. Anhydritic units and evaporite solution breccia are present in the lower part of the member. The coarser grained nature of the sandstone, together with its abundant crossbedding and desiccation cracks, imply a mostly intertidal foreshore environment for at least the upper part of the unit. Evidence for evaporites, in the form of solution breccias, in the lower part of the unit is mostly circumstantial, though in some localities minor interbeds of anhydrite are present. The intervening beds are poorly exposed and interpretations are at best speculative, but the beds appear to be mainly of subtidal origin.

Westward and northwestward toward the geosyncline, the upper member of the Blanley Bay Formation is correlative with the Baumann Fiord Formation, an evaporite sequence which, with some reservations, was interpreted by Mossop (1979) as being of supratidal, sabkha origin. If that

interpretation is correct, nonmarine sediments or a hiatus should be present toward the craton (Trettin, 1975, p. 14). This contradicts the subtidal-intertidal interpretation of the member. If the present interpretation is correct, intertidal or subtidal rocks should be present basinward. The Baumann Fiord Formation consists of numerous cycles with laminated lime mudstone, stromatolites, desiccation cracks, and flat-pebble conglomerate in the lower part and laminated anhydrite in the upper part. This sequence was interpreted by Mossop (1979) as a regressive, subtidal to supratidal cycle. However, he cautioned (Mossop, 1979, p. 19): "Apart from desiccation cracks in the host dolomite, which could be considered direct evidence of emergence, there are no unequivocal criteria on which a sabkha interpretation can be founded". If the lower carbonate sequence is interpreted as intertidal and the anhydrite as subtidal, which is compatible with Mossop's observations, the paleogeographic picture becomes more cohesive: a dominantly subtidal anhydrite sequence toward the deeper part of the carbonate ramp and subtidal and intertidal sediments toward the craton.

Eleanor River Formation

Members A and C of the Eleanor River Formation are composed of the typical thick bedded, subtidal lithology already encountered in the Cape Clay and Bear Point formations. Rare, flat-pebble conglomerate at Dundas Harbour and zones of intraclast grainstone show that member C was deposited immediately below or at wave base. Member A is of deep, subtidal origin.

At the end of deposition of member A, water depth decreased until a shallow subtidal or intertidal environment was established, in which the laminated lithologies of member B were deposited. Circulation was restricted so that evaporitic units formed locally. The change in water depth and increase in salinity are amply documented by desiccation cracks, minor flat-pebble conglomerate, lamination and evaporitic interbeds and solution breccia. Toward the basin, as shown in section 28, these peritidal rocks interfingered with subtidal rocks (units B 151-154 and B 162). Similar subtidal units are present also in the Dundas Harbour area.

Member D marks the gradual change in water depth and circulation patterns from the deep, normal marine conditions of member C of the Eleanor River Formation to the shallower, restricted environment of most of the Bay Fiord Formation. Member D comprises limestone laminites, thin bedded dolomite and minor amounts of anhydrite. Small scale crossbedding, channels and winnowed strata are present in the member which is, mainly because of the absence of flat-pebble conglomerate, interpreted as shallow subtidal. The laminites formed probably during periods of restricted circulation (Davies and Ludlam, 1973) and low energy.

Bay Fiord Formation

During deposition of the anhydrite of member A circulation restriction reached its maximum. These evaporites were deposited in a quiet, subtidal environment. They are mostly laminated, which is compatible with subaqueous origin (Dean et al., 1975). No intertidal features, such as flat-pebble conglomerate or desiccation cracks, were observed in any of the sections. As in member B of the Cass Fjord Formation, wave base is assumed to be less than 50 m.

Member B of the Bay Fiord Formation consists of thin and very thin bedded dolomite, in part interlaminated with gypsum. Desiccation cracks and flat-pebble conglomerate are virtually absent and the unit is presumed to have been deposited in a subtidal, subwavebase environment similar to that of member B. In contrast to member A, however, circulation was somewhat better and less anhydrite was deposited. Halite casts are present, but could have formed by displacement of the sediment from the bottom of the Dead Sea, as reported by Kendall (1978).

Regional studies of Ellesmere Island (Kerr, 1968) indicate that the Bay Fiord Formation increases in thickness westward, and becomes increasingly shaly and silty, indicating the increasing proximity of the basin. Evaporites are restricted to a central belt. On northern Ellesmere Island shallow carbonates have been found (Trettin, pers. comm., 1982) that possibly indicate a barrier at the shelf edge, but it is not known how continuous these rocks are. Two models of evaporite formation are applicable: either a restricted basin or an epeiric sea with high evaporation. The epeiric sea model is similar to models proposed by Richter-Bernburg (1953) and Arkhangel'skaya and Grigor'yev (1960).

Member C of the Bay Fiord Formation marks the return of normal marine conditions. The unit consists of thick bedded, fossiliferous, and burrowed dolomite and is probably of subtidal origin, perhaps at wave base.

Member D comprises mostly medium and thin bedded dolomite, somewhat burrowed and containing skeletal fragments. The environment of deposition was probably similar to that of member C, but the salinity of the water may have been slightly above normal.

Thumb Mountain Formation

In general appearance, the Thumb Mountain Formation is similar to other burrowed, massive Ordovician formations. However, the lower member is dolomite, while part of the upper member shows definite features of shallow water deposition.

The environment of deposition for the lower member and much of the upper member is below wave base. In the upper part, the formation becomes fossiliferous and contains fragments of coralline algae. These, if not transported, are a good indicator of shallow water.

Irene Bay Formation

No shallow water sedimentary features are known from the Irene Bay Formation and, according to the lithology, the unit would be a deep subtidal deposit. However, the profuse fauna makes a shallow water environment more probable.

Allen Bay Formation

The lower member of the Allen Bay Formation indicates a continuation of conditions similar to that of the upper part of the Thumb Mountain Formation and the Irene Bay Formation. Wilson (1975, p. 73) implies a water depth of more than 30 m for tabular stromatoporoids, the presence of dasycladaceans would indicate a maximum depth of 30 m.

It is evident from the foregoing that in the Thumb Mountain and Irene Bay formations and in the lower unit of the Allen Bay Formation, the estimated depth of 50 m for wave base does not agree with the faunal evidence. Presumably the change from carbonate ramp to carbonate platform was a gradational process which started during late Ordovician time and was completed by the onset of Silurian time. Evidence for a barrier or shallow area toward the geosynclinal basin is present in the Thumb Mountain Formation near Prince Alfred Bay, about 130 km to the northwest (Morrow and Kerr, 1977).

The middle member consists of two distinct lithofacies of shallow water origin: dark, massive, very fossiliferous dolomite and light coloured, laminated dolomite. The rich fauna of the massive lithofacies indicates normal or near normal salinity; the sediment surface must have been above wave base, because wherever the original texture can be discerned, grainstone or packstone is present. In contrast to the massive lithofacies, the laminated lithofacies is devoid of fossils, but patterned carbonate is present in outcrop and evaporites are known from the subsurface. These features are indicative of restricted circulation. Lamination, stromatolitic features, and rare, flat-pebble conglomerate place these rocks in an intertidal environment. Thus, for the middle member of the Allen Bay Formation, the picture emerges of a protected platform with intertidal, algal shoal, and shallow, subtidal lagoons and channels, teeming with marine life.

The upper member similarly contains a thick bedded and a laminated lithofacies. Interpretation is analogous: the thick bedded lithofacies originated from shallow, turbulent water, but as the rock is poorly fossiliferous it may have formed under somewhat higher salinity conditions than those of the middle member. The laminated lithofacies of the upper member is interpreted as inter- and supra-tidal. There are indications that evaporites were present in the member, but it is not clear how they related to the two lithofacies. Overall, the depositional environment of the member is that of an intertidal area, characterized by rapidly shifting subenvironments that range from subtidal channels to supratidal levees.

Cape Storm Formation

The environment of the Cape Storm Formation has been extensively discussed by Jones (1974) and Jones and Dixon (1975) (Read Bay or Leopold formations of these authors). It was also discussed by Morrow and Kerr (1977). All authors agree on an intertidal to supratidal environment with slightly restricted circulation. Observations, although limited in the present study, do not contradict the conclusions of these authors. During deposition of the upper part of the formation, however, water depth increased and normal marine conditions were gradually re-established. This interpretation is based on the presence of nodular lime mudstone and the fauna in the upper part.

Douro Formation

The Douro Formation consists of lime mudstone with features of moderate water agitation. The interspersed zones of brachiopod floatstone are both life and death assemblages (Smith, 1976) and not much transport appears to have occurred. Rare, flat-pebble conglomerate may indicate occasional shallowing to an intertidal level. The formation is here interpreted as a subtidal sediment and probably was deposited at wave base. Brachiopods probably settled in areas where some moderate currents supplied nutrients. Smith (1976) proposed minor depressions as optimum locations, but slopes of a gently undulating sea-bottom, where mud accumulation was less rapid, appear to be more probable sites.

Mud mounds generally develop in deeper water on the foreslope of platform margins (Wilson, 1975) below wave base. No grainstone cap (indicating shallower water at top) was observed at locality 50, but the brachiopodal rudstone in fissures within the mound may indicate shallow water at a stage after the mound had formed. Regionally, there is good paleogeographical fit with deep water mud mounds in the northern part of the area (i.e. close to the platform edge).

Barlow Inlet Formation

The lower member is the northward extension of the Peel Sound Formation (Thorsteinsson and Uyeno, 1981) and represents terrigenous influx on a deep, subtidal carbonate platform.

The upper member consists of two contrasting lithofacies. The thin bedded, laminated lithofacies is placed in an intertidal to supratidal environment, because of the presence of ripple marks, desiccation cracks and fine, planar lamination. The areas where this lithofacies formed were probably shoals, which were occasionally inundated, and the water evaporated rapidly to cause synaeresis cracks to form in high salinity puddles on top of the shoals. Only salinity-tolerant ostracodes and gastropods managed to eke out a living. Surrounding the shoals were protected subtidal areas with near normal salinity in which the mudstone of the thick bedded lithofacies accumulated. Tidal channels occasionally carried eroded material from the shoals into the deeper areas. Small bioherms also developed in the deeper areas and may have reached above wave base. Possibly the intertidal-supratidal shoals developed in the lee of bioherms; however, present field observations are not detailed enough to substantiate this relationship.

The large reef at Gascoyne Inlet is about 60 km southwest of the Silurian platform edge on central Cornwallis Island, and it is unclear whether it is still part of the reefal complex at the seaward front of the platform or represents an extraordinary large patch reef behind that edge.

Devon Island Formation

Morrow and Kerr (1977) interpreted the lower part of the Devon Island Formation some 70 km north of the present exposures as a clinothem deposited on a paleoslope. The lithological features of the exposures examined during the present study imply a similar environment. The beds were certainly deposited below wave base; only planar lamination was seen and the dark colour implies euxinic conditions. There are abundant burrows, thus deposition probably did not take place in the deepest part of the basin but higher up on the slope. Several beds of bioclastic grainstone and rudstone are interpreted as deposits of turbidity flows.

Sophia Lake Formation

The lithofacies of the Sophia Lake Formation is dominated by laminated detrital carbonates; intraformational conglomerate, anhydrite intervals, and desiccation cracks are other noteworthy features. The ample, fine lamination, in combination with the other features, indicates a restricted, supratidal environment.

Comments on sea level fluctuations

On Table 4, a curve of relative water depth for Devon Island, derived from Table 3, and a "global" water depth curve are plotted. The "global" curve is based mainly on information by Leggett et al. (1981) from Europe; it contains modifications from Fortey (1982) and Lenz (1982).

Leggett et al. (1981) tentatively recognized three periods of eustatic sea level rise, Middle and Upper Cambrian, upper Llandeilian and Caradocian, Llandoverian and lower Wenlockian. On Devon Island, only the Llandeilian-Caradocian transgression can be seen in the deposits of members C and D of the Thumb Mountain Formation. A trace of the beginning of the Cambrian eustatic rise may be the Bear Point Formation, but the remainder of that period on Devon Island is either absent or represented by the shallow water sediments of the Cass Fjord Formation. Likewise, the Lower-Middle Silurian eustatic sea level high has shallow water equivalents (middle and upper Allen Bay Formation) on Devon Island. Similarities in smaller-scale sea level fluctuations can be recognized in two intervals. The Tremadocian and Arenigian transgressions are represented by the Cape Clay and Eleanor River formations. Lowering of sea level by the Ashgillian glaciations (see, for example, Destombes, 1981) may be the cause for the discontinuity at the base of the Irene Bay Formation and the disconformity at the Silurian-Ordovician boundary.

Hassel, Kanguk and Eureka Sound formations

Hassel and Kanguk formations

These two units are poorly exposed; the Hassel Formation is probably a nonmarine, fluvial unit, while the Kanguk Formation consists of marine shale, deposited in the deeper parts of a shelf area.

Eureka Sound Formation

Generally in the Arctic Archipelago, the Eureka Sound Formation contains a lower marine and an upper nonmarine interval. The outcrops at Viks Fiord are part of the upper, fluvial sequence. Large, planar crossbeds, as at locality 52, are most common in braided streams (Miall, 1977), whereas the overlying fine grained sandstone, siltstone, and coal are more characteristic of river floodplain deposits or abandoned river channels.

CHAPTER V

STRUCTURAL GEOLOGY

Devon Island is situated within the Central Stable Region of the continent, and includes two contrasting geological terranes: Precambrian crystalline rocks of the Canadian Shield, and Phanerozoic sedimentary rocks of the Arctic Platform (Fig. 4). The crystalline rocks are exposed mainly in the ice-covered eastern part of the island, and the overlying sedimentary succession outcrops over the remainder of the island. The crystalline rocks are part of a dissected highland belt that extends from Baffin Island to southeastern Ellesmere Island and forms the eastern border of the Canadian Arctic Archipelago. The greater part of the Phanerozoic succession consists of lower Paleozoic rocks that form a westerly thickening wedge. Also present are widely separated outliers of Mesozoic and Tertiary sediments lying unconformably on the lower Paleozoic rocks. These sediments are preserved in grabens, and represent remnants of a transgressive succession that overspread southeastern parts of the archipelago.

Numerous faults cut both the crystalline and sedimentary terranes. Most of the faults are normal, and of little stratigraphic displacement, whereas others of much greater displacement relate mainly to grabens or half grabens.

Haughton Astrobleme, a circular impact crater, forms a conspicuous physiographic and structural feature in western Devon Island. The astrobleme, which is Miocene in age, consists of much faulted lower Paleozoic formations that are overlain unconformably by impact breccia.

Two peneplaned surfaces on Devon Island are of particular interest in establishing the sequence and chronology of important structural events that have affected this island, as well as neighboring parts of the archipelago and Baffin Bay since Early Cretaceous time. The younger peneplane, which is late Paleogene in age, is represented by the present-day plateau surface. The older is marked by the base of the transgressive Hassel to Eureka Sound formations. It is Albian or older in age, but younger than the lower Paleozoic succession.

Devon homocline and arch

Two regional structural features characterize the westerly thickening wedge of early Paleozoic rocks: west of about meridian 88°00'W, the rocks form a uniform west-dipping homocline; east of this meridian the overall westerly dip of the rocks is modified by a broad, west-plunging arch that strikes approximately along the axis of the island (Fig. 79). In the west-dipping homocline, the rocks are inclined more steeply than the truncated plateau surface so that they form bands of northerly trending outcrops, with progressively younger formations appearing to the west. This structure was named the Devon homocline by Fortier (1963a)[1]. The west-striking arch, here named the Devon arch, has been effected, in part, by gentle downwarping of its flanks and, in part, by faulting in which displacements along prevailing westerly trending faults in the north flank of the arch tend to step down toward Jones Sound, whereas displacements along similarly trending faults in the south flank step down toward Lancaster Sound (see structure sections EF, *Bear Bay East*; CD, *Powell Inlet*).

There is reason to believe that the lower Paleozoic succession is considerably thicker in westernmost parts of Devon Island than it is farther to the east. For one thing, several of the Paleozoic formations on Devon Island clearly thicken to the east. For another, the lower Paleozoic succession of the island is similar in lithology to that of Cornwallis Island (to the west and across Wellington Channel) where the succession is of geosynclinal thickness (see Table 2). Thus, although the aggregate thickness of the various lower Paleozoic formations on Devon Island, as obtained during the present study, is about 3700 m, many of the formations could be measured only in eastern parts of Devon Island; and the thickness of the column of these rocks in westernmost parts of the island is clearly much greater, probably in the order of 10 000 m, or more.

Faults and grabens

Devon Island is broken by numerous, steeply dipping normal faults. Transcurrent faults are apparently absent. A single, high-angle reverse fault occurs at the east entrance to Powell Inlet (Fig. 80). Where fault planes have been observed, they are commonly surfaces of simple separation (Fig. 71), though some are marked by up-drags (Fig. 80), or downfolds, and still others are characterized by zones of shattered bedrock (Fig. 81). The traces of faults are relatively straight or gently curved, and those that have proved mappable on the accompanying geological maps vary in length from a few hundred metres to a maximum of about 100 km. The dip of individual faults, where determinable, is generally in the order of 80 degrees to vertical. The maximum stratigraphic displacement on most faults ranges from a few metres to about 100 m. A few faults have greater displacements, and the maximum displacement of roughly 600 m, exhibited on the fault that preserved the half-graben at Stratton Inlet and Burnett Inlet, represents the maximum for the report area.

[1] Fortier (1963a) considered that all the lower Paleozoic rocks on Devon Island comprise a westerly dipping homoclinal succession. The presence of the Devon arch, and consequent restriction of the area included in the homocline, are concepts that have arisen out of the present investigation.

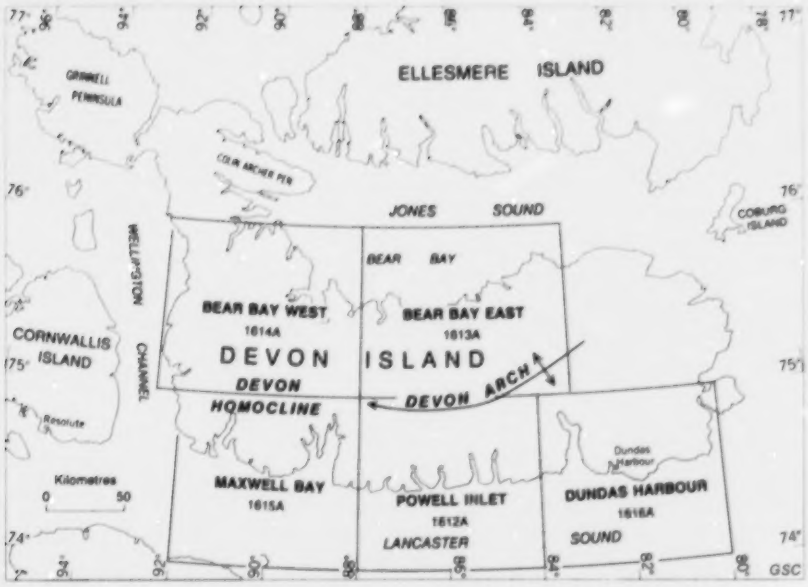


Figure 79. *Map showing distribution of Devon arch and homocline.*

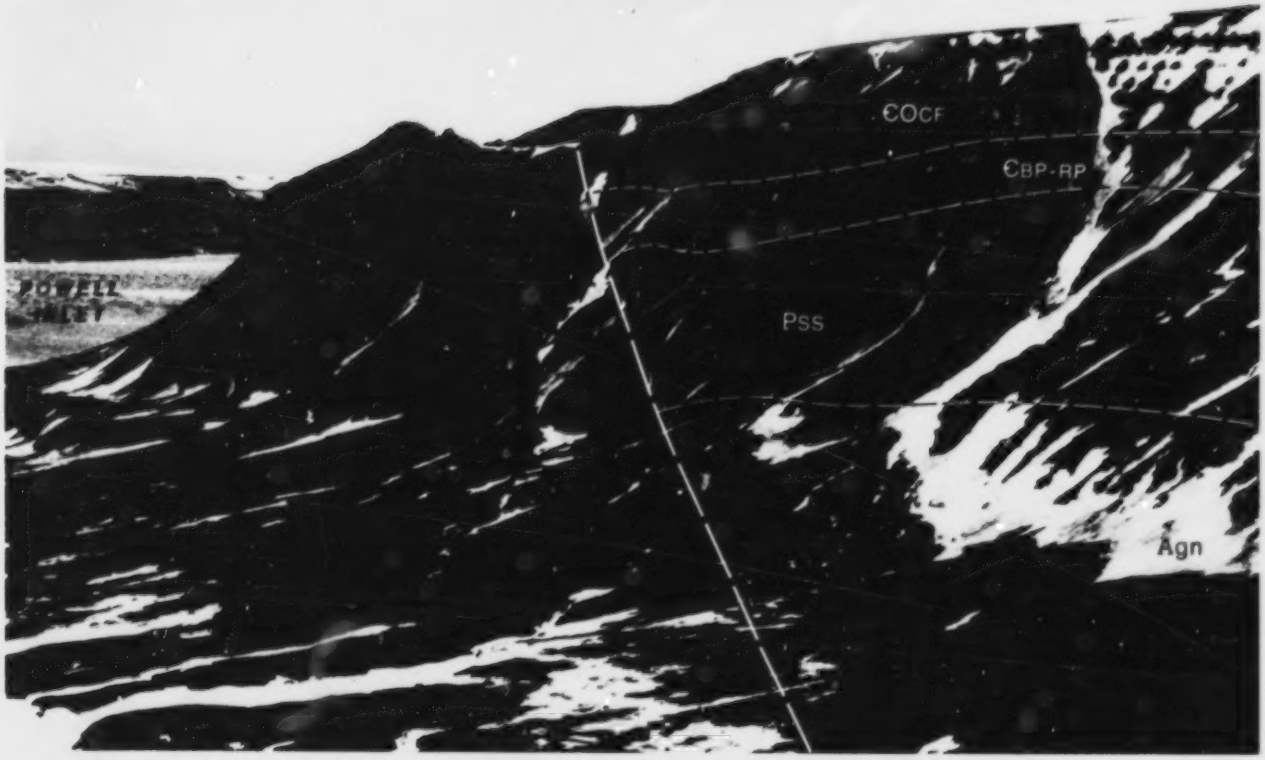


Figure 80. *High-angle reverse fault with prominent drag fold, at the east entrance to Powell Inlet on the south coast of Devon Island (**Powell Inlet**). View is to the north-northwest. Stratigraphic displacement on the fault is estimated to be about 350 m.* Agn *= Precambrian gneiss;* Pss *= Strathcona Sound Formation;* €BP-RP *= Bear Point and Rabbit Point formations;* €OCF *= Cass Fjord Formation.*

Figure 81. *Normal fault, downdropping Cape Clay Formation* (OCC) *against Cass Fjord Formation* (€OCF), *about 20 km west of the head of Croker Bay in southeastern Devon Island (see Station 74;* ***Powell Inlet****). The dip separation is about 75 m. The fault is marked by a zone of shattered rock. Crossed hammers mark a prominent unit of quartz sandstone (here about 14 m thick) that occurs in member C of the Cass Fjord* (€OCF-C) *everywhere on Devon Island.* €OCF-D = *upper resistant member of Cass Fjord.*

The faults of Devon Island, excluding those within Haughton Astrobleme, are divisible into three main, areally separated systems (Fig. 82):

1. Within *Bear Bay East, Powell Inlet* and *Dundas Harbour* map areas, the regional trend of faults is approximately northwest (see figures 83, 84).

2. In far western parts of *Bear Bay West* and *Maxwell Bay*, the regional trend of faults is essentially northeast and, therefore, at diametric variance to that of the faults in the three previously mentioned map areas.

3. Situated geographically between these two fault systems and, therefore, within eastern parts of *Bear Bay West* and *Maxwell Bay* map areas is a system of cross faults that includes northwesterly and northeasterly striking faults. The northwesterly striking fault system in the Paleozoic rocks of northern Devon Island (*Bear Bay East*) tends to parallel the structural grain of the underlying Precambrian rocks (Fig. 83; Frisch, 1981), but in southern parts of the island (*Powell Inlet, Dundas Harbour*), which are also characterized by faults of similar trends, no preferred structural grain is apparent in the Precambrian rocks (Frisch, 1979).

Relatively long and narrow grabens, several of which preserve outliers of the transgressive package that includes the Hassel to Eureka Sound formations, are particularly prominent features in the landscape of *Bear Bay West* (Fig. 76) and *Maxwell Bay*. The presence of such grabens in these map areas, and their absence in *Bear Bay East, Powell Inlet* and *Dundas Harbour* is puzzling, but may be related to the presence of halite in the Bay Fiord Formation in the subsurface of the western map areas, and the absence of halite to the east. It should be pointed out that although there is no evidence of halite in any exposures of the Bay Fiord examined in the report area, the formation constitutes subcrop only throughout large parts of western Devon Island, and it is there that the formation might well contain halite, on the basis of the following considerations. A thick sequence of halite beds occurs in the Bay Fiord Formation in a well on Bathurst Island (Dominion Explorers et al. Bathurst Caledonian R.J.-34; see Mayr, 1980). Although halite has not

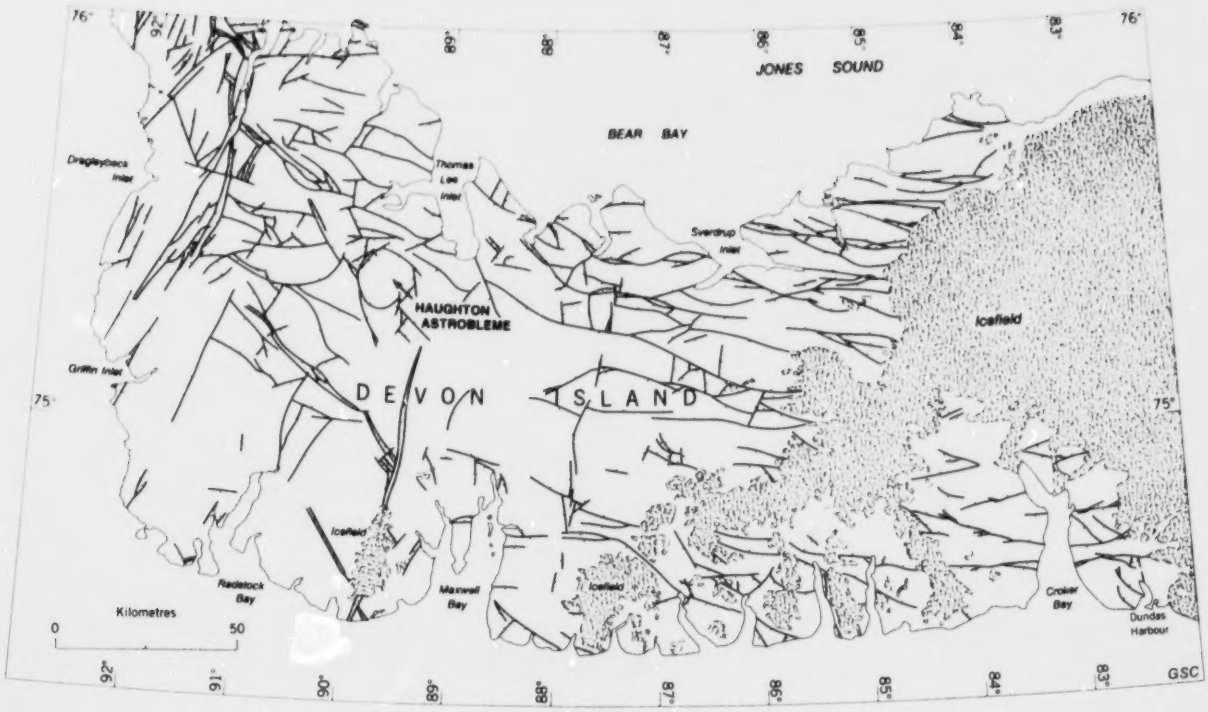


Figure 82. *Fault systems on Devon Island.*

been observed in outcrops of the Bay Fiord on Cornwallis Island, the formation contains conspicuous amounts of solution breccia, the presence of which suggests that halite beds probably were present at one time but have been removed by solution. Grabens with dimensions similar to those on Devon Island and commonly preserving outliers of the Eureka Sound and Isachsen formations are relatively common structural features on Cornwallis Island; and there they occur only in parts of the island known to be underlain by the Bay Fiord (Thorsteinsson and Kerr, 1968). In addition, a graben with a similar geological setting occurs on Bathurst Island (Kerr, 1974). On the basis of these circumstances, a plausible explanation of the origin of the grabens on Bathurst, Cornwallis, and Devon islands is that they have resulted from the solution of Bay Fiord halite along single faults extending downward into rocks of the Precambrian Shield, that in turn caused subsidence and the development of one or more complementary parallel faults that produced the grabens. If this is in fact the manner in which the grabens were formed, the probability is that the complementary faults extend downward only to the level of the Bay Fiord Formation.

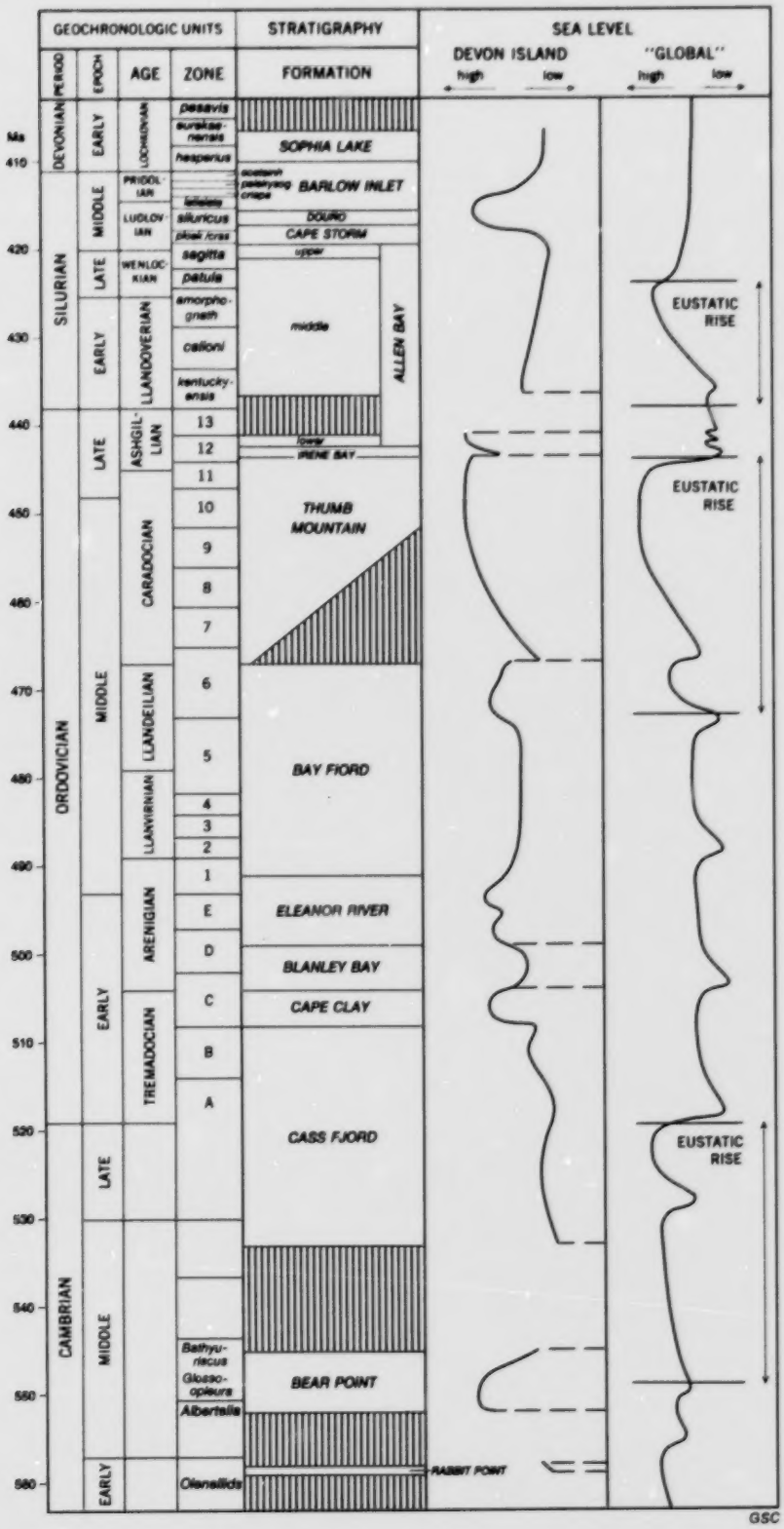
Two regions of half-grabens occur in south coastal regions of the island (*Powell Inlet*, *Dundas Harbour*), where major faults have caused outcrops of the Bay Fiord, Thumb Mountain, Irene Bay and Allen Bay formations to be preserved far to the east of their main occurrence, in the *Bear Bay West* and *Maxwell Bay* map areas.

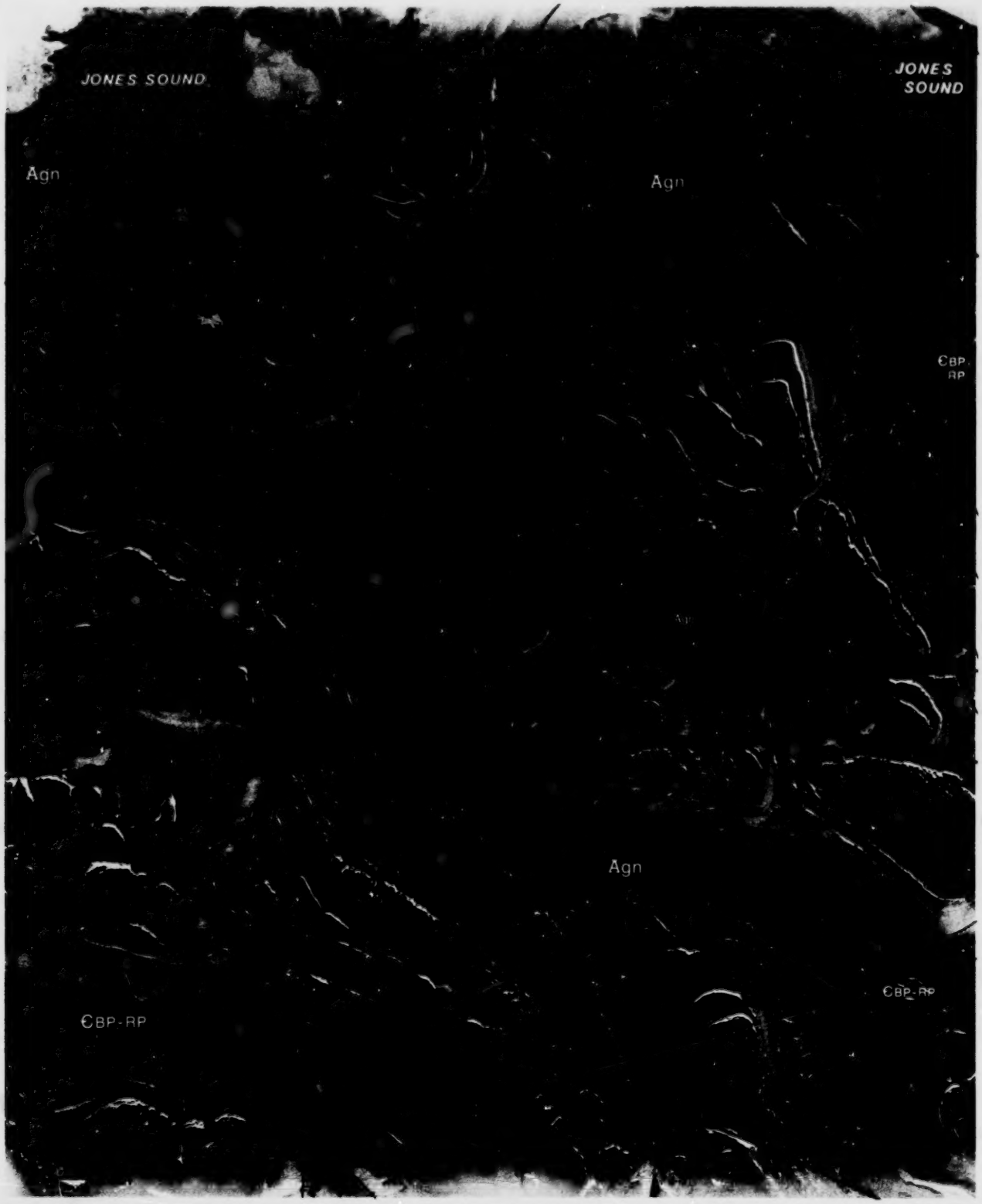
Haughton Astrobleme

The Haughton impact crater is about 16 km in diameter. It exhibits a small fault system of its own within the much larger area of the cross-fault system of *Bear Bay West* (see Frisch and Thorsteinsson, 1978). Paleozoic formations exposed in the crater include, in ascending order: the Eleanor River, Bay Fiord, Thumb Mountain, Irene Bay and Allen Bay. Also occurring in the crater are two unnamed formations: one consists of impact breccia; the other is made up of lake sediments that are Miocene in age. Numerous unsorted clasts of Precambrian crystalline rocks occur in the impact breccia, indicating that the Precambrian basement, estimated to be at least 1700 m below the region of the crater, was affected by the impacting object. The Allen Bay Formation constitutes surface exposure around all but the easternmost part of the crater's border, where the Thumb Mountain and Irene Bay formations are exposed. The Paleozoic formations in the crater are broken by a series of annular and radial faults. The gross structural features of the crater include: a central horst area, represented by two irregularly shaped inliers of the Eleanor River Formation, surrounded by impact breccia; and an outer graben area. The rocks of the Eleanor River are considerably deformed and only the upper part of the formation, estimated to include about 150 m of beds, is exposed. It is, however, raised about 800 m above its original position outside the crater. From the central uplift to the rim of the crater are fault blocks that include more or less progressively younger Paleozoic formations. The crater is bounded by an interconnecting series of annular faults, and at the outermost of these the Allen Bay Formation appears to be invariably downdropped toward the crater's centre.

Figure 83. *Oblique aerial photograph (T435L-38) looking west along the north coast of Devon Island (**Bear Bay East**). The photograph illustrates that the northwesterly regional strike of faults transecting the Phanerozoic cover corresponds with the structural grain of crystalline rocks of the Canadian Shield.* Agn *= Precambrian gneiss;* CBP-RP *= Bear Point and Rabbit Point formations;* COCF *= Cass Fjord Formation. Arrow marks Station 10, where the photograph for Figure 27 was taken. X marks the centre of traverse along which section 23 (Fig. 7) was measured. In this section the Rabbit Point Formation is absent and the Bear Point lies directly on Precambrian rocks.*

TABLE 4. Plot of relative water depth, Devon Island versus "global".




JONES SOUND
JONES SOUND
Agn
Agn
Agn

CHAPTER VI

ECONOMIC GEOLOGY

Oil and gas

Eastern parts of Devon Island that are included in the map areas of *Dundas Harbour*, *Powell Inlet*, and *Bear Bay East* are characterized by a cover of Paleozoic sediments that is probably too thin to offer significant oil and gas potential. It may be noted, however, that poor to good porosity occurs in the fluvial sandstone of the Rabbit Point Formation and in member C of the Cass Fjord Formation of eastern Devon Island. Only the western parts of the report area that are represented by the map areas of *Maxwell Bay* and *Bear Bay West* can be considered as prospective for oil and gas. These map areas are underlain by a westerly dipping homoclinal succession of Cambrian to Lower Devonian strata that consists mainly of carbonates with lesser amounts of Ordovician evaporites. The greatest thickness of the succession occurs in westernmost parts of the *Maxwell Bay* and *Bear Bay West* map areas, and can only be estimated as being in the order of 10 000 m. The westerly dip is partly the result of the original dip of the sediments, which thicken into correlative rocks of the Franklinian Miogeosyncline on neighboring Cornwallis Island; and partly the result of the regional east to west tilting of Devon Island as a whole. Thus, it would appear that the lower Paleozoic strata of *Maxwell Bay* and *Bear Bay West* have remained in a westerly dipping orientation throughout all of Phanerozoic time.

Three types of oil and gas plays seem theoretically possible in western Devon Island:

1. The Allen Bay Formation is potentially the most prospective formation, and offers reservoir possibilities in the intergranular porosity of its bioherms, biostromes and solution breccias. Locally, these rocks are fetid and exhibit bituminous residues. To the west, in the environs of Cornwallis Island, the Allen Bay gives place laterally to graptolitic shale and limestone of the Cape Phillips Formation that may have provided source rocks for oil and gas migrating updip into the Allen Bay.

2. The biohermal limestone masses in the upper part of the Douro Formation and lower part of the Barlow Inlet are of some interest. Although these reefs are small and appear to have poor porosity and permeability, there is a possibility that large dolomitized reefs of these ages may occur farther west in the subsurface, and constitute potential hydrocarbon-bearing structures.

3. Leaching and isostatic adjustment of the halite believed (but not proved; see p. 52) to occur in the Bay Fiord Formation could conceivably provide the trapping mechanism for oil and gas accumulations, as in the Michigan Basin, where these processes have had a strong influence on the localization of hydrocarbons.

There are, however, several factors that lead one to conclude that the prospects for oil and gas in western Devon Island are not good. No seepages of oil or gas have been observed. Except for the Allen Bay Formation, the other carbonate formations appear to have generally poor porosity and permeability. No anticlinal structures are present, and the numerous faults in the region are probably all late Paleogene in age and, therefore, too late in time to have constituted a trapping mechanism for migration of hydrocarbon updip. The Cambrian to Devonian succession appears to represent more or less continuous deposition, and no regional unconformities are known that might have permitted the development of stratigraphic traps associated with unconformities. A most serious drawback with regard to the region's petroleum potential is the fact that the Paleozoic succession has remained at all times in an updip orientation, and has been breached by one, and perhaps more, episodes of peneplanation, so that oil and gas accumulations that may have at one time occurred there have been lost.

A single well, Imperial 10E Panarctic et al. Devon Island (see section 54 on figs. 10, 11; also Fig. 67), has been drilled on Devon Island. The well penetrated the Barlow Inlet, Douro, and Cape Storm formations, and the upper and middle members of the Allen Bay Formation. No hydrocarbons were encountered. Drillstem tests in the Allen Bay Formation recovered drilling mud and saltwater. Analysis of core 4 of the formation indicated 1.0 to 4.3 per cent porosity, and a maximum permeability of 0.01 and 1.10 md.

Hydrocarbon maturity studies of the archipelago by Henao-Londoño (1977) and Powell (1978) do not extend as far east as the Devon E-45 well, but the Conodont Colour Index "CAI" (Epstein et al., 1977) provides an indication of organic metamorphism in this region. The CAI values for most of the conodonts collected on Devon Island range from 1 to 1.5. Only at Burnett Inlet (*Maxwell Bay*) were values of 2 and 2.5 recorded. The relationship between the CAI and organic metamorphism appears to depend on local conditions, including the lithology of the conodont host rock. Preliminary studies of two wells on Bjorne Peninsula, Ellesmere Island, by Mayr et al. (1978) showed that in Silurian and Ordovician carbonates the limit between mature and overmature coincided with a CAI value of about 2. Presumably, therefore, on Devon Island, the grade of organic maturity is favourable for the generation of hydrocarbons.

Minerals

No mineral deposits of potential economic value were observed on Devon Island.

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APPENDIX I

COORDINATES OF STATIONS[1]

Station No.	Map Sheet	Coordinates	UTM	Area
1	Dundas Harbour	74°34'N 82°22'W	17X; 459700E, 8275900N	4.5 km N of Johnson Bay
2	Dundas Harbour	74°37'N 82°33'W	17X; 454100E, 8280550N	2.5 km NNW of head of Dundas Harbour
3	Dundas Harbour	74°34'N 82°32'W	17X; 454250E, 8276300N	6 km N of Lemieux Point
4	Dundas Harbour	74°36'N 82°44'W	17X; 448500E, 8276700N	8 km NW of Lemieux Point
5	Dundas Harbour	74°39'N 82°47'W	17X; 447200E, 8285625N	10 km NW of head of Dundas Harbour
6	Dundas Harbour	74°42'N 83°25'W	17X; 438200E, 8287400N	23 km NW of Lemieux Point
7	As Station 6			
8	Dundas Harbour	74°43'N 83°07'W	17X; 437800E, 8293000N	22 km NW of head of Dundas Harbour
9	Dundas Harbour	74°47.8'N 82°53.6'W	17X; 444000E, 8301875N	East side of Croker Bay
10	Bear Bay East	75°28.0'N 85°27.4'W	16X; 543300E, 8376150N	7 km NE of head of east arm of Sverdrup Inlet
11	Dundas Harbour	74°40'N 83'41"W	17X; 420900E, 8289000N	14.5 km N of Cape Home
12	Powell Inlet	75°57'N 84°10'W	16X; 582050E, 8319750N	9 km WNW of head of Croker Bay
13	Powell Inlet	74°31'N 84°32'W	16X; 574200E, 8270125N	11.5 km E of Cape Bullen
14	Powell Inlet	74°41'N 85°04'W	16X; 557000E, 8289700N	2 km W of head Cuming Inlet
15	Powell Inlet	74°30'N 85°13'W	16X; 553600E, 8268375N	9 km W of Cape Bullen
16	Powell Inlet	74°29'N 85°15'W	16X; 552200E, 8267700N	10 km W of Cape Bullen
17	Powell Inlet	74°35'N 86°07'W	16X; 526250E, 8276550N	11 km N of east corner of Burnett Inlet
18	Powell Inlet	74°35'N 86°07'W	16X; 526050E, 8277375N	12 km N of east corner of Burnett Inlet
19	Powell Inlet	74°30'N 86°17'W	16X; 521400E, 8268200N	5 km WNW of east corner of Burnett Inlet
20	Powell Inlet	74°30'N 86°21'W	16X; 519600E, 8268200N	7 km WNW of east corner of Burnett Inlet

[1] The stations listed here are shown on the accompanying geological maps. Most stations mark locations of measured sections; others mark locations of single fossil collections or outcrops of special significance mentioned in text. It should be noted also that measured sections are referred to by numbers that correspond to station numbers. Thus, for example, section 19 was measured at Station 19.

APPENDIX I (cont.)

COORDINATES OF STATIONS

Station No.	Map Sheet	Coordinates	UTM	Area
21	Powell Inlet	74°32'N 87°46'W	16X; 477500E, 8271550N	1.5 km N of head of unnamed bay east side of Valley
22	Bear Bay East	75°05'N 84°12'W	16X; 580650E, 8334700N	21 km NNW of head of Crocker Bay
23	Bear Bay East	75°32'N 85°19'W	16X; 546300E, 8383000N	16 km SSW of Cape Newman Smith
24	Bear Bay East	75°23'N 85°28'W	16X; 543500E, 8365900N	4 km SSE of head of Sverdrup Inlet, east arm
25	Bear Bay East	75°19'N 86°05'W	16X; 526100E, 8358700N	17.5 km SW of head of Sverdrup Inlet, east arm
26	Bear Bay East	75°35'N 87°07'W	16X; 496750E, 8388500N	7 km SE of Cape Svarten
27A	Bear Bay East	75°34'N 87°50'W	16X; 476800E, 8386100N	16 km WSW of Cape Svarten
27B	Bear Bay East	75°33'N 87°52'W	16X; 476000E, 8385500N	17 km WSW of Cape Svarten
28	Bear Bay East	75°32'N 88°13'W	16X; 466350E, 8383100N	22.5 SSE of Skruis Point
29	Bear Bay West	75°37'N 88°54'W	16X; 447100E, 8392900N	8 km SSW of Skruis Point
30	Bear Bay West	75°32'N 89°10'W	16X; 440000E, 8383300N	20 km SSW of Skruis Point
31	Bear Bay West	75°31'N 89°10'W	16X; 439875E, 8381300N	22 km SSW of Skruis Point
32	Bear Bay West	75°21'N 89°09'W	16X; 439375E, 8364300N	10 km SSW of head of Thomas Lee Inlet
33	Bear Bay West	75°16.9'N 89°36.3'W	16X; 454500E, 8356700N	16 km SSE of head of Thomas Lee Inlet
34	Maxwell Bay	74°33'N 89°40'W	16X; 421000E, 8275000N	10 km E of Cape Hurd
35	Maxwell Bay	74°32'N 89°46'W	16X; 417750E, 8273900N	6.5 km E of Cape Hurd
36	Maxwell Bay	74°32'N 89°54'W	16X; 413700E, 8273800N	2.5 km E of Cape Hurd
37	Maxwell Bay	74°36'N 90°05'W	15X; 586375E, 8280300N	1.5 km WNW of head of Rigby Bay
38	Maxwell Bay	74°36'N 90°28'W	15X; 575100E, 8280500N	Cape Eardley Wilmot
39	Maxwell Bay	74°44'N 91°18'W	15X; 555200E, 8295550N	Dealy Point
40	Maxwell Bay	74°44'N 91°18'W	15X; 555300E, 8295750N	Dealy Point
41	Maxwell Bay	74°40'N 91°21'W	15X; 548750E, 8286675N	4.5 km NNW of Cape Ricketts, east side of Gascoyne Inlet

APPENDIX I (cont.)

COORDINATES OF STATIONS

Station No.	Map Sheet	Coordinates	UTM	Area
42	Maxwell Bay	74°40'N 91°21'W	15X; 548675E, 8286200N	4 km NNW of Cape Ricketts, west side of Gascoyne Inlet
43	Maxwell Bay	74°39'N 91°28'W	15X; 545200E 8284450N	7 km ESE of Cape Riley
44	Maxwell Bay	74°40'N 91°40'N	15X; 539100E, 8287000N	1 km E of Cape Riley
45	Maxwell Bay	74°42'N 91°48'W	15X; 535000E, 8299000N	East coast of Beechey Island
46	Maxwell Bay	74°46'N 91°58'W	15X; 530250E, 8297375N	Cape Spencer
47	Bear Bay West	75°13'N 92°08'W	15X; 524600E, 8347250N	6 km N of Griffin Inlet
48	Bear Bay West	75°20'N 92°27'W	15X; 516000E, 8360500N	Domville Point
49	Bear Bay West	75°31'N 91°38'W	15X; 538250E, 8381600N	18.5 km SE of John Brown Point
50	Bear Bay West	75°36'N 91°45'W	15X; 534875E, 8391400N	7 km ENE of Brown Point
51	Bear Bay West	75°52'N 89°49'W	15X; 550600E, 8412300N	3.5 km SSE of head of Viks Fiord
52	Bear Bay West	75°47'N 91°10'W	15X; 550750E, 8413050N	3 km SSE of head of Viks Fiord
53	Bear Bay West	75°52'N 89°45'W	16X; 424700E, 8420550N	East side of Sandhook Bay, opposite Sandhook
54	Bear Bay West	75°04'N 91°48'W	15X; 534550E, 8331700N	13 km E of Cape McBain
55	Bear Bay West	75°10'N 92°05'W	15X; 525825E, 8342750N	1.5 km N of head of Griffin Inlet
56	Maxwell Bay	74°59'52"N 92°02'10"W	15X; 527650E, 8323500N	3.5 km E of Stuart Point
57	Bear Bay East	75°21.2'N 86°49.8'W	16X; 504800E 8362850N	6 km W of head of west arm of Sverdrup
58	Bear Bay West	75°30.5'N 88°15.5'W	16X; 465000E, 8380250N	17 km NW of head of Thomas Lee Inlet
59	Bear Bay West	76°00'08"N 89°58'W	16X; 419650E, 8437250N	Boat Point
60	Bear Bay West	75°04.6'N 89°41.2'W	16X; 422900E, 8334000N	45 km SW of head of Thomas Lee Inlet
61	Bear Bay West	75°18.6'N 89°25.8'W	16X; 431300E, 8369500N	18 km SW of head of Thomas Lee Inlet
62	Bear Bay West	75°30.6'N 92°10.8'W	15X; 522900E, 8380600N	5 km SSE of Eden Point
63	Bear Bay West	75°21.1'N 92°24.9'W	15X; 516500E, 8362675N	Cape King

APPENDIX I (cont.)

COORDINATES OF STATIONS

Station No.	Map Sheet	Coordinates	UTM	Area
64	Bear Bay West	75°26.6'N 91°32.8'W	15X; 543450E, 8370850N	36 km N of head of Sophia Cove
65	Bear Bay West	75°27.9'N 91°25.0'W	15X; 544500E, 8375900N	39 km N of head of Sophia Cove
66	Bear Bay West	75°29.9'N 91°35.4'W	15X; 539600E, 8372250N	35 km N of head of Sophia Cove
67	Bear Bay West	75°18.1'N 90°42.7'W	15X; 569175E, 8355250N	38 km NE of head of Sophia Cove
68	Bear Bay West	75°41.8'N 90°51.5'W	15X; 559200E, 8402400N	16 km SE of head of south arm of Viks Fiord
69	Bear Bay West	75°23.8'N 89°32.6'W	16X; 428600E, 8369625N	17 km W of head of Thomas Lee Inlet
70	Bear Bay West	75°24.1'N 85°48.2'W	16X; 421200E, 8370250N	29 km W of head of Thomas Lee Inlet
71	Bear Bay West	75°23.9'N 85°49.0'W	16X; 420750E, 8369850N	29 km W of head of Thomas Lee Inlet
72	Powell Inlet	74°41.0'N 85°29.6'W	16X; 544500E, 8288750N	Head of Powell Inlet
73	Dundas Harbour	74°46.6'N 83°24.6'W	17X; 429175E, 8290900N	11 km N of Cape Rosamond
74	Powell Inlet	74°52.8'N 84°18.7'W	16X; 578400E, 8312200N	22 km W of head of Crocker Bay
75	Maxwell Bay	74°37.4'N 90°37.3'W	15X; 570350E, 8282850N	Wallis Point
76	Bear Bay West	75°45'N 91°15'W	15X; 548200E, 8407900N	7.5 km S of head of Viks Fiord

APPENDIX II

DESCRIPTIONS OF STRATIGRAPHIC SECTIONS

This appendix contains the descriptions to most of the sections plotted on the stratigraphic cross-sections (Figs. 7-11). Field descriptions were made by T.A. Garagan, U. Mayr, G.M. Narbonne and R. Thorsteinsson. Their original field notes have been edited by Mayr.

Section letters and unit numbers are plotted on figures on the left side of the lithological columns, original field measurements are on the right side of the columns. The sections were measured with a 1.5 m staff. An aneroid barometer was used for some large, covered intervals.

COMPOSITE STRATIGRAPHIC SECTION A_1, CROKER BAY - DUNDAS HARBOUR AREA

Formation	Loc. No.	Description	Field Interval
Allen Bay	5	Narbonne	15.3-184.2
Irene Bay	5	Narbonne	0.0-15.3
Thumb Mountain	6	Mayr	187.5-243.0
Bay Fiord	6	Mayr	2.0-187.5
Eleanor River	2	Narbonne	151.1-302.0
Blanley Bay	8	Mayr	0.0-112.7
Cape Clay	3	Mayr	408.3-475.0
Cass Fjord	3	Mayr	74.1-408.3
Bear Point	12	Narbonne	3.9-50.5
Rabbit Point	1	Mayr	0.0-13.0

Unit	Description	Thickness in metres: Unit	Total from base
	ALLEN BAY FORMATION Middle member (Silurian)		
	Overlying beds not exposed		
178	**Dolomite:** very light grey, medium crystalline, medium bedded, weathers light grey, stromatoporoid molds and casts common, poor exposure, felsenmeer	2.0	1154.3
177	Covered interval: scree as in unit 172	10.0	1152.3
176	**Dolomite:** medium brown-buff, finely crystalline, very thin bedded; interbedded with minor **lime mudstone**, medium brown-buff, medium bedded; fossiliferous, lamellar stromatoporoids common, pentamerids and *Favosites* sp. rare; both lithologies weather brown-buff; poor exposure, felsenmeer (GSC loc. C-77217, conodonts)	26.0	1142.3
175	Covered interval	14.2	1116.3
174	**Dolomite:** slightly calcareous, light grey-brown, very thin bedded; skeletal(?) **packstone;** weathers light grey-brown; pentamerids common (GSC loc. C-77215, conodonts)	2.0	1102.1

Unit	Description	Thickness in metres: Unit	Total from base
173	**Dolomite:** very light grey, medium to coarsely crystalline; medium bedded, with internal lamination; rare small patches of sparite; weathers very light grey, poor exposure, felsenmeer	2.5	1100.1
172	**Dolomite:** calcareous, very light grey, very finely crystalline, very vuggy, weathers very light grey, crumbly; silicified fossils common, *Favosites* sp., *Syringopora* sp., stromatoporoids, brachiopods; poor exposure, felsenmeer	12.0	1097.6
171	**Limestone:** as in unit 170; thin to medium bedded, nodular; stromatoporoids and brachiopods common; poor exposure, felsenmeer	9.0	1085.6
170	**Limestone:** dolomitic, light grey-buff, medium bedded, wavy bedding; skeletal **packstone,** very fine **calcarenite;** weathers light grey-buff; upper part of unit fossiliferous, stromatoporoids common, brachiopods and tabulate corals rare	8.5	1076.6
169	**Limestone breccia:** medium brown-buff, clasts 1-3 cm long, very thick bedded, vuggy, weathers medium brown-buff, recessive	2.2	1068.1
168	Covered interval	3.0	1065.9
	Lower member (Ordovician)		
167	**Limestone:** dolomitic, medium grey, very thick bedded, labyrinthine mottling; **lime mudstone** and skeletal **wackestone;** weathers medium grey-buff, resistant; rare brachiopods and solitary rugose corals	19.5	1062.9
166	**Limestone:** as in unit 164	25.9	1043.4
165	Covered interval	16.5	1017.5
164	**Limestone:** as in unit 162; interbedded with minor, medium bedded, intraclastic **floatstone** and **mudstone**	3.1	1001.0
163	**Limestone:** as unit 162	6.0	997.9
162	**Limestone:** dolomitic, medium grey, very thick bedded, labyrinthine mottling; **lime mudstone** with minor **wackestone;** weathers medium grey-buff, resistant; rare orthocones, solitary rugose corals, tabulate corals, crinoid fragments	11.5	991.9
	Total exposed thickness of Allen Bay Formation: 173.9 m		
	Irene Bay Formation (Ordovician)		
161	**Limestone:** dolomitic, medium grey, medium bedded, wavy bedding; numerous hematite coated hardgrounds throughout; upper boundary prominent hard-ground; skeletal **wackestone;** weathers yellow-buff, recessive, rubbly; fossils common, orthocones, corals, trilobites, crinoid fragments, tracks (GSC loc. C-77438, conodonts, base; C-77439, conodonts, top)	10.5	980.4
160	Covered interval: scree of green **shale** at base	4.8	969.9
	Total thickness of Irene Bay Formation: 15.3 m		
	THUMB MOUNTAIN FORMATION (ORDOVICIAN) Upper member		
159	**Limestone:** dolomitic, light grey; very thick bedded with internal, wavy, thin bedding, minor labyrinthine mottling; upper contact prominent brown-black hardground; skeletal **wackestone;** unit forms cliff (GSC loc. C-77369, conodonts, top)	43.0	965.1

Unit	Description	Thickness in metres: Unit	Total from base
158	**Limestone:** slightly dolomitic, light grey, thin bedded, nodular; **lime mudstone** gradational to skeletal **wackestone;** zones of small white **chert** nodules; weathers very rubbly; *Receptaculites* sp., *Maclurites* sp., corals, brachiopods common; upper boundary of unit very gradational (GSC loc. C-77365, conodonts, base; C-77366, conodonts, 5 m below top)	12.5	922.1
	Total thickness of Thumb Mountain Formation: 55.5 m		
	BAY FIORD FORMATION (ORDOVICIAN)		
	Member D		
157	**Dolomite:** calcareous, slightly silty, light grey-green, finely crystalline, medium bedded; upper boundary hardground; some burrowed intervals; grades upward into **lime mudstone;** skeletal debris on uppermost bedding plane (GSC loc. C-77364, conodonts, top)	1.5	909.6
156	Covered interval	4.8	908.1
155	**Dolomite:** silty, calcareous, very light grey-pink, finely crystalline, medium bedded with internal lamination (GSC loc. C-77363, X-ray analysis)	1.2	903.3
154	Covered interval: probably **dolomite** as unit 143 and minor green **shale**	34.5	902.1
153	**Dolomite:** very slightly calcareous and silty, light grey-brown, finely to very finely crystalline, very thin to thin bedded with internal lamination, weathers recessive	4.5	867.6
	Member C		
152	**Dolomite:** medium grey, medium crystalline, thin to medium bedded, intensely burrowed, resistant, weathers rusty coloured	5.4	863.1
151	**Dolomite:** calcareous, yellow and brown speckled, medium crystalline, very thin bedded; abundant brachiopods and bryozoans on hardground (GSC loc. C-77362, conodonts)	0.1	857.7
150	**Dolomite:** slightly calcareous, light green and yellow, finely crystalline, thin to medium bedded, intensely burrowed; some argillaceous, nodular intervals; units 150 to 152 form prominent, resistant marker	7.0	857.6
	Member B		
149	Covered interval: probably medium grey-green, dolomitic **shale**	6.9	850.6
148	**Dolomite:** argillaceous, very light pink-yellow, very finely crystalline, thin bedded, reotrophic structures	0.65	843.7
147	**Shale** and **dolomite:** light green, very thinly laminated, slightly nodular	0.20	843.05
146	**Limestone breccia:** dolomitic	0.05	842.85
145	**Dolomite:** medium grey, very finely crystalline, thin to very thin bedded; uniform, planar lamination	1.7	842.8
144	Covered interval	4.3	841.1
143	**Dolomite:** as in unit 141 (GSC loc. C-77360, X-ray analysis)	1.2	836.8
142	Covered interval	9.2	835.6
141	**Dolomite:** slightly silty, very light [illegible]y, very finely crystalline, medium bedded	1.0	826.4

Unit	Description	Thickness in metres: Unit	Total from base
140	Covered interval	5.8	825.4
139	**Siltstone:** as in unit 137; thin to very thin bedded	6.0	819.6
138	Covered interval	7.5	813.6
137	**Siltstone:** dolomitic, medium green-grey, fine grained, thin bedded; interbeds of flat pebble **conglomerate** and **shale**; weathers rubbly and shaly (GSC loc. C-77359, X-ray analysis)	7.5	806.1
136	Covered interval	6.0	798.6
135	**Dolomite:** argillaceous, medium brown-grey, very finely to aphanocrystalline; interbedded with green **shale**; very thin bedded; poor exposure	5.0	792.6
	Member A		
134	Covered interval	28.0	787.6
133	Covered interval: possibly **dolomite:** calcareous and gypsiferous, dark grey-brown, laminated; interbedded with dark grey **breccia**	15.0	759.6
132	**Dolomite:** calcareous, light brown, medium crystalline, thin bedded, fractured and slightly brecciated, weathers green	1.0	744.6
131	**Limestone breccia:** white; poorly exposed.	7.0	743.6
	Total thickness of Bay Fiord Formation: 173.0 m		
	ELEANOR RIVER FORMATION (ORDOVICIAN) Member D		
130	**Limestone:** dolomitic and silty, light grey-brown, thin bedded and laminated; burrowed and nodular zone in middle part of unit	2.1	736.6
129	**Limestone:** dolomitic and silty, light red-brown, thin bedded with internal lamination, ripple marks; interbeds of shaly, thinly laminated **dolomite** and stromatolitic **lime mudstone; chert** nodules (GSC loc. C-77356, X-ray analysis)	3.4	734.5
128	**Limestone:** light red-brown, thinly laminated, small LLH stromatolites; **lime mudstone**	0.5	731.1
127	Covered interval	5.8	730.6
126	**Dolomite:** calcareous and silty, very light grey-brown, finely crystalline, thin bedded, mottled, recessive	0.7	724.8
	ELEANOR RIVER FORMATION (ORDOVICIAN) Member C		
125	**Limestone:** dolomitic, medium grey, thin to medium bedded, nodular; **lime mudstone;** weathers rubbly (GSC loc. C-77286, conodonts)	8.5	724.1
124	**Limestone:** dolomitic, medium grey; medium bedded, and lenticular thin bedding; **lime mudstone**	1.4	715.6
123	Covered interval	1.5	714.2
122	**Limestone:** dolomitic, medium grey, nodular and wavy bedding	3.0	712.7

Unit	Description	Thickness in metres: Unit	Total from base
121	**Limestone:** medium grey, medium bedded; **lime mudstone** with minor lenses of skeletal **grainstone**; semi-recessive	9.0	709.7
120	**Limestone:** medium to dark grey, medium to thick bedded; **lime mudstone** and minor skeletal **wackestone**; silicified fossils, gastropods and crinoid fragments common, trilobites and brachiopods rare (GSC loc. C-77284, macrofossils)	7.5	700.7
119	**Limestone:** dolomitic, medium grey, thin to medium bedded, wavy and nodular; **lime mudstone**; trace fossils, *Chondrites* sp., *Planolites* sp.	4.5	693.2
118	**Limestone:** medium grey, medium bedded; **lime mudstone**	2.0	688.7
117	**Limestone:** dolomitic, medium grey; medium bedded at base, thick bedded at top; rare SH and LLH stromatolites; **lime mudstone**; **chert** nodules, some surfaces with granule-sized intraclasts; rare fossils, trilobites, crinoid and brachiopod fragments, gastropods, trails (*Planolites* sp. and *Chondrites* sp.)	6.0	686.7
116	**Limestone:** medium grey, very thin to thin bedded, rare dolomitic laminae, small SH stromatolites common	2.2	680.7
115	**Limestone:** dolomitic, medium grey, thin to medium bedded, slightly nodular; **lime mudstone**; thin bed of intraclastic **flatstone** (1.0 x 0.5 cm clasts)	1.7	678.5
114	**Limestone:** medium grey, thinly laminated; stromatolitic **boundstone**, LLH 1.0-3.0 x 0.1-0.5 m	1.5	676.8
113	**Limestone:** medium grey brown; gastropod **floatstone**	0.2	675.3
112	**Limestone:** medium grey, thin bedded with internal thin lamination; channel with low-angle, planar crossbedding; **lime mudstone** with minor **intraclastic mudstone**; dolomitic laminae; rare fossils (GSC loc. 77281, macrofossils; C-77282, conodonts; both 2.5 m above base)	3.1	675.1
111	**Limestone:** medium grey; stromatolitic **boundstone**; planar mat with LLH stromatolites in basal part, upper part SH and LLH stromatolites	1.8	672.0
110	Covered interval	14.5	670.2
	Member B		
109	**Limestone:** dolomitic, medium grey, very thin bedded to laminated; very thin **dolomite** seams; highly recessive	1.0	655.7
108	**Limestone:** dolomitic, medium grey, thick bedded, nodular; **lime mudstone**; fossils rare, ?*Maclurites* sp., curved orthocone, *Chondrites* sp. and *Planolites* sp.	3.6	654.7
107	**Limestone:** dolomitic, medium grey, thin bedded, nodular	1.0	651.1
106	**Limestone:** medium grey, very thin wavy bedding with internal lamination; **dolomite** laminae; resistant	6.0	650.1
105	**Limestone:** as in unit 104; poor exposure; recessive	3.4	644.1
104	**Limestone:** dolomitic, medium grey, thin bedded, synaeresis cracks, recessive; trails (*Chondrites* sp.) abundant, trilobites and ?*Maclurites* sp. rare	1.9	640.7
103	**Limestone:** stromatolitic **boundstone** as in unit 100	1.0	638.8
102	Covered interval	4.1	637.8
101	**Limestone:** medium grey, medium bedded; **lime mudstone**	1.3	633.7

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
100	**Limestone:** medium grey, thinly laminated; stromatolitic **boundstone,** largely planar with some very low domes, 2.0 m in diameter	1.0	632.4
99	Covered interval	0.8	631.4
98	**Limestone:** as in unit 96	1.5	630.6
97	**Limestone:** medium grey; stromatolitic **boundstone;** planar mat passing upward into small LLH and rare SH stromatolites; overlain by intraclastic **floatstone** with oolitic and intraclastic matrix	0.5	629.1
96	**Limestone:** dolomitic, medium grey, thin bedded, nodular; abundant *Chondrites* sp. (GSC loc. C-77276, conodonts)	1.0	628.6
95	**Limestone breccia:** clasts of stromatolitic **boundstone**	0.3	627.6
94	**Limestone:** medium grey; thinly laminated; stromatolitic **boundstone;** planar smooth mat passing upward into isolated heads (0.5 x 0.5 m); abundant gypsum crystal molds	1.6	627.3
93	Covered interval: scree as in units 90 and 92	6.0	625.7
92	**Dolomite:** highly calcareous, light grey, very finely crystalline, very thin bedded with internal lamination; probably detrital **dolosiltite;** *Skolithos* sp. common	0.2	619.7
	Member A		
91	**Limestone:** dolomitic, medium grey, thin to medium bedded, nodular, **lime mudstone; chert** nodules; *Planolites* sp. and *Chondrites* sp. common	2.6	619.5
90	**Limestone:** dolomitic, medium grey, medium bedded, nodular, minor labyrinthine mottling	3.3	616.9
89	**Limestone:** dolomitic, medium grey, thin to medium bedded, wavy and nodular, minor labyrinthine mottling; rare fossil fragments	3.6	613.6
88	**Limestone:** dolomitic, medium grey, nodular	0.2	610.0
87	**Limestone:** dolomitic, medium grey, very thick bedded, labyrinthine mottling; **lime mudstone** with thin lenses of **wackestone;** rare fossil fragments, *Planolites* sp. abundant	2.0	609.8
86	**Limestone:** as in unit 84 (GSC loc. C-77271, conodonts)	2.7	607.8
85	**Limestone:** dolomitic, medium grey, medium to thick bedded, nodular, minor labyrinthine mottling; **lime mudstone;** single bed of skeletal **grainstone** with erosional base and megaripples; rare fossil fragments	6.6	605.1
84	**Limestone:** dolomitic, medium grey; thick bedded, wavy and nodular; **lime mudstone** with lenses of skeletal **wackestone;** rare fossil fragments; *Planolites* sp. and *Chondrites* sp. common	7.5	598.5
83	**Limestone:** dolomitic, medium grey, medium bedded, labyrinthine mottles; **lime mudstone** and minor skeletal **wackestone;** orthocone and gastropod fragments	6.0	590.9
82	**Limestone:** dolomitic, medium grey, thin to medium bedded, wavy; **lime mudstone** with minor intraclastic and skeletal **packstone**	6.1	584.9
81	**Limestone:** medium grey, very thick bedded; **lime mudstone;** resistant; rare fossil fragments	2.6	578.8

Unit	Description	Thickness in metres: Unit	Total from base
80	**Limestone:** dolomitic, medium grey, medium bedded, labyrinthine mottling, minor nodular; **lime mudstone**; semi-recessive; orthocone and gastropod fragments, *Chondrites* sp. and *Planolites* sp. (GSC loc. 77267, conodonts)	3.0	576.2
	Total thickness of Eleanor River Formation: 163.4 m		
	BLANLEY BAY FORMATION (ORDOVICIAN)		
	Upper member		
79	Covered interval: in lower part poor outcrops of **dolomite,** slightly silty, light brown-grey, finely crystalline, medium bedded with internal planar lamination, weathers white	81.7	573.2
	Lower member		
78	**Dolomite:** slightly calcareous, medium to dark brown, medium crystalline, medium bedded with internal lamination; zones of flat-pebble **conglomerate;** weathers very light brown-grey (GSC loc. C-77146, conodonts)	6.0	491.5
77	**Dolomite:** light brown, medium crystalline, thinly laminated; interbedded with papery **shale;** weathers shaly (GSC loc. C-77145, X-ray analysis)	3.3	485.5
76	**Dolomite:** light brown, medium crystalline, medium bedded with internal lamination; rare flat-pebble **conglomerate** beds; weathers very light grey	7.6	482.2
75	**Dolomite:** medium brown, finely crystalline, thin bedded to laminated; beds of flat-pebble **conglomerate** (top of unit is formed by 0.4 m thick bed); weathers green	5.6	474.6
74	Covered interval	1.0	469.0
73	**Limestone:** medium brown, regular planar lamination; **lime mudstone;** top of unit formed by flat-pebble **conglomerate**	0.6	468.0
72	Covered interval	0.3	467.4
71	**Limestone:** as below; very thin bedded, nodular; abundant **chert** nodules (GSC loc. C-77143, conodonts)	0.9	467.1
70	**Limestone:** dolomitic, light brown, thick bedded, labyrinthine mottling; **lime mudstone**	1.6	466.2
69	Covered interval	2.0	464.6
68	**Limestone:** dolomitic, medium dark brown, very thin bedded, nodular; dolomitic **shale** partings; in uppermost part thin bedded flat-pebble **conglomerate** with 1.0-2.0 cm clasts	0.9	462.6
67	Covered interval: laminated **dolomite** in scree	1.2	461.7
	Total thickness of Blanley Bay Formation: 112.7 m		
	CAPE CLAY FORMATION (ORDOVICIAN)		
66	**Limestone:** as in unit 64; thin interbedded intervals of **limestone** as in unit 65; resistant (GSC loc. C-77325, conodonts, top of unit)	13.0	460.5
65	**Limestone:** dolomitic, medium grey-brown, massive; intraclast **grainstone**	1.0	447.5

Unit	Description	Thickness in metres: Unit	Total from base
64	**Limestone:** dolomitic, light grey, massive, abundant labyrinthine mottling; **lime mudstone;** rare apex-upward orthocones (GSC loc. C-77323, conodonts)	12.0	466.5
63	**Dolomite:** calcareous, light grey-brown, medium crystalline, massive, intensively burrowed; grading upward into unit 64	2.0	454.5
62	**Limestone:** dolomitic, light grey-brown; massive with internal very thin beds and **dolomite** laminae; skeletal **wacke-** and **pack-stone;** white **chert** nodules	0.5	432.5
61	**Limestone:** variably dolomitic, light grey, massive, labyrinthine mottling; **lime mudstone** with very rare scattered skeletal (?trilobite) fragments; zone of **chert** nodules; very rare small stromatolites (GSC loc. C-77319, thin section, Fig. 31)	27.0	432.0
60	**Dolomite:** light grey-yellow, coarsely crystalline, massive, mottled; lower contact gradational	2.5	405.0
59	**Limestone:** dolomitic, light grey, massive, labyrinthine mottling; **lime mudstone** (GSC loc. C-77318, conodonts)	8.7	402.5
	Total thickness of Cape Clay Formation: 66.7 m		
	CASS FJORD FORMATION (ORDOVICIAN-CAMBRIAN)		
	Member D		
58	**Limestone:** as in unit 54	0.8	393.8
57	**Limestone:** dolomitic, light grey; massive with irregular, very thin, internal bedding, burrows(?); **lime mudstone;** traces of **breccia**	0.8	393.0
56	**Limestone:** as in unit 54	0.2	392.2
55	**Dolomite:** calcareous, very light grey, medium crystalline, very thick bedded, mottles and irregular lamination, bioturbation(?)	2.0	392.0
54	**Limestone:** very light grey, very thin bedded, nodular; light green argillaceous partings; rare, small, planispiral gastropods (GSC loc. C-77314, conodonts)	0.3	390.0
53	**Dolomite:** calcareous in upper part, light grey, medium crystalline, very thin bedded, intensely burrowed; pelletoidal(?) **grainstone;** abundant interbeds of flat-pebble **conglomerate**	12.2	389.7
	Member C		
52	**Sandstone:** light grey brown, coarse grained, thick bedded, ripple marks, mud cracks, small channels; conglomeratic zones	2.8	377.5
51	**Dolomite:** slightly silty, light green, finely crystalline, laminated to very thin bedded; dolomite probably detrital	3.1	374.7
50	**Sandstone:** dolomitic, very light brown, medium grained, medium bedded, lamination and trough crossbedding; **quartz arenite** with rare orthoclast and carbonate clasts, dolomite cement; flat-pebble **conglomerate** in upper parts	2.1	371.6
49	**Interbedded shale (70%), siltstone (20%) and sandstone (10%). Shale:** medium green-grey. **Siltstone:** light green-grey, very thin bedded, individual beds with erosional, sandy base. **Sandstone:** light brown, medium grained, thin bedded, conglomeratic, flat siltstone pebbles. Lithologies appear to be arranged in 0.4-2.0 m thick, coarsening-upward cycles	9.0	369.5
48	**Sandstone:** dolomitic, yellow, coarse grained, medium bedded, trough cross-beds; **quartz arenite** with minor carbonate clasts, bimodal	16.0	360.5

Unit	Description	Thickness in metres: Unit	Total from base
47	**Siltstone:** dolomitic, medium grey-brown, thick bedded; gradational to very fine grained **sandstone**	12.5	344.5
46	**Sandstone:** calcareous, white-yellow, coarse grained, thick bedded, vague crossbedding, (?)flaser bedding; in part conglomeratic; *section crosses fault zone, 15.0-20.0 m repetition of sequence possible*	16.6	332.0
45	**Siltstone:** dolomitic, very light grey, medium bedded with internal wavy lamination	0.4	315.4
44	**Dolomite:** calcareous, very sandy, very light grey, medium crystalline, medium bedded; intraclast **grainstone** (GSC loc. 77310, thin section, Fig. 29)	9.5	315.0
43	Covered interval	6.3	305.5
42	**Dolomite:** sandy and calcareous, light brown-yellow, medium crystalline, medium bedded	1.0	299.2
41	Covered interval	8.2	298.2
40	**Interbedded dolomite** and **shale. Dolomite:** sandy, light green-grey, medium crystalline, thin to very thin bedded, high angle crossbeds. **Dolomite:** light grey, aphanocrystalline. **Shale:** dolomitic, green. Also minor flat-pebble conglomerate	6.0	290.0
39	**Shale:** dark green; soft	2.5	284.0
38	**Dolomite:** sandy, very light grey, medium crystalline; single bed; quartz and various feldspars; dolomite probably detrital	0.5	281.5
37	**Shale:** dark grey-green	2.7	281.0
36	**Dolomite:** silty, calcareous, laminated, rusty weathering; poor exposure	18.0	278.3
35	**Shale:** grey; interbedded with **dolomite**, silty, medium grey, aphanocrystalline; thin bedded; upper boundary gradational	1.8	260.3
	Member B		
34	Lens of nodular **anhydrite:** breccia of dolomite fragments	0.5	258.5
33	**Shale:** as in unit 31	5.5	258.0
32	**Dolomite:** medium grey, slightly silty, finely crystalline, laminated to thinly laminated; dolomite detrital, lens of nodular **anhydrite**; resistant (GSC loc. C-77307, X-ray analysis)	1.9	252.5
31	**Shale:** gypsiferous, medium grey-green, weathering 'papery'	26.5	250.6
30	**Dolomite:** light grey, aphanocrystalline, thick bedded; stringers and nodules of pink **anhydrite**	5.4	224.1
29	**Shale:** gypsiferous, light green-grey; in part weathering papery	4.9	218.7
28	**Shale:** light grey-brown, laminated; interlaminated with **gypsum** (GSC loc. C-77306, X-ray analysis)	1.5	213.8
27	**Shale:** slightly calcareous, green-grey; interbedded with minor beds of silty **dolomite**	3.1	212.3
26	Covered interval: probably **shale**, silty and calcareous, medium green-grey	2.6	209.2

Unit	Description	Thickness in metres: Unit	Total from base
	Member A		
25	**Dolomite:** silty and very slightly calcareous, medium to dark grey-green, very thin to thin bedded, lamination, ripple-marks; rare flat-pebble **conglomerate** beds; unit is resistant and supports waterfall in section (GSC loc. C-77305, X-ray analysis)	22.5	206.6
24	**Dolomite:** silty and very slightly calcareous, medium grey-green, medium and finely crystalline, very thin to thin bedded, slightly wavy bedding; thin beds of intraformational **conglomerate**; interbeds of purple and green **shale,** particularly in lower part	9.6	184.1
23	Snow covered interval: small outcrop of **dolomite,** light grey, aphanocrystalline, medium bedded; overlain by flat-pebble **conglomerate**	20.6	174.5
22	**Dolomite:** medium grey, aphanocrystalline, medium and thick bedded, ripple marks	1.0	153.9
21	Covered interval	4.2	152.9
20	**Dolomite:** silty, medium grey-green, very finely crystalline, laminated to very thin bedded, flaser bedding; 0.1 m bed of flat-pebble **conglomerate** (GSC loc. C-77050, X-ray analysis)	1.2	148.7
19	Covered interval: small outcrop of silty **dolomite**	4.5	147.5
18	**Dolomite:** slightly argillaceous, light grey, very finely crystalline, very thin bedded to laminated, slightly wavy bedding, ripple marks; abundant **shale** partings, interbeds of flat-pebble **conglomerate,** thin beds of crossbedded, medium crystalline **dolomite**	11.2	143.0
17	Covered interval	7.6	131.8
16	**Dolomite:** as in unit 14	4.6	124.2
15	Covered interval	42.7	119.6
14	**Dolomite:** silty, medium grey, finely and medium crystalline, very thin bedded, wavy to nodular; very thin seams of light green **shale,** flat-pebble **conglomerate** at base and top of unit (GSC loc. C-77036, X-ray analysis)	4.5	76.9
13	Snow covered interval	11.9	72.4
12	**Sandstone:** very slightly calcareous, light grey, very fine grained, thin bedded with internal lamination, current parting lineation, traces of low-angle crossbeds, trails; glauconitic laminae; recessive; very sharp lower boundary	0.9	60.5
	Total thickness of Cass Fjord Formation: 334.2 m		
	BEAR POINT FORMATION (CAMBRIAN) Upper member		
11	**Dolomite:** as in unit 9; very thick bedded, vuggy, very resistant	16.5	59.6
10	**Dolomite:** sandy, white, coarsely crystalline, very thick bedded, very vuggy, weathers yellow, resistant	2.0	43.1
9	**Dolomite:** medium to dark grey, finely crystalline, medium bedded, nodular, weathers yellow-orange, resistant	2.0	41.1

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	Middle member		
8	**Limestone:** dolomitic, argillaceous, medium grey, medium bedded, nodular; **lime mudstone** with rare skeletal **grainstone** in upper part; semi-resistant	11.0	39.1
7	Covered interval: probably **limestone** as in unit 8	9.1	28.1
	Lower member		
6	**Limestone:** argillaceous, medium grey, thin bedded, nodular; **lime mudstone** and minor skeletal **wackestone**; weathers green-grey, recessive; abundant trilobite fragments	6.0	19.0
	Total thickness of Bear Point Formation: 46.6 m		
	RABBIT POINT FORMATION (CAMBRIAN)		
5	**Sandstone:** white, fine grained, thin bedded, rubbly outcrop; abundant *Planolites* sp.	1.0	13.0
4	**Sandstone:** calcareous, light brown, medium grained, medium bedded; lenses of coarse skeletal debris; trilobite and crinoid fragments	0.8	12.0
3	**Sandstone:** white-yellow, coarse grained, medium bedded, trough crossbeds; poorly sorted **quartz arenite**	4.6	11.2
2	Covered interval: scree of light coloured **sandstone**	5.6	6.6
1	Covered interval: scree of **sandstone,** maroon, coarse grained; **quartz arenite** with traces of feldspar	1.0	1.0
	Total thickness of Rabbit Point Formation: 13.0 m		
	Section underlain by Precambrian gneiss		

STRATIGRAPHIC SECTION A_2, DUNDAS HARBOUR

Formation	Loc. No.	Description	Field Interval
Bear Point	3	Mayr	30.5-74.1 (type section)
Rabbit Point	3	Thorsteinsson	0.0-6.1 (type section)

Overlying unit: basal **sandstone** of the Cass Fjord Formation

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	BEAR POINT FORMATION (CAMBRIAN) Upper member		
20	**Dolomite:** sandy, medium grey, medium crystalline, thick bedded with internal lamination, xenotopic; detrital and authigenic feldspar, traces of glauconite and phosphate; weathers rusty with pink lamination, rubbly outcrop; lower boundary gradational, upper boundary sharp (GSC loc. C-77035, X-ray analysis)	2.4	57.0
19	**Dolomite:** slightly silty, sandy and calcareous, medium grey, medium crystalline, medium bedded, internal nodular and wavy lamination, hypidiotopic, weathers rusty-yellow; lower boundary gradational	10.7	54.6

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	Middle member		
18	**Limestone:** dolomitic, medium grey, thin to medium bedded, labyrinthine mottles and burrows; **lime mudstone** with lenses of skeletal and coated-grain **grainstone** (GSC loc. C-77044, X-ray analysis)	2.4	43.9
17	**Limestone:** as below in unit 15; shale partings; poorly exposed unit	2.1	41.5
16	Covered interval	3.1	39.4
15	**Limestone:** dolomitic, medium to dark grey, thin to very thin bedded, dolomitic laminae and labyrinthine mottles; **lime mudstone** with skeletal fragments and authigenic feldspar; weathers yellow grey	6.1	36.3
	Lower member		
14	Covered interval	4.5	30.2
13	**Limestone:** dolomitic, medium grey, very thin bedded with rare medium beds; **lime mudstone** and skeletal **wackestone;** trace glauconite; fragments of trilobites and *Cambrotrypa* sp.	3.7	25.7
12	**Limestone:** as in unit 9; thin resistant interbeds of **limestone** as in unit 10; trilobites (GSC loc. C-77033, 0.3 m below top of unit)	0.9	22.0
11	Covered interval	2.6	21.1
10	**Limestone:** dolomitic and sandy, medium grey brown; single resistant bed, labyrinthine mottling; skeletal **wackestone** with fragments of trilobites, crinoids, *Cambrotrypa* sp. (GSC loc. C-77032, thin section, Fig. 22)	0.3	18.5
9	**Limestone:** slightly argillaceous, light grey-brown, very thin bedded, nodular, shaly laminae, weathers recessive; abundant trilobites (GSC loc. C-77031, 0.3 m below top of unit; C-77030, 0.5 m below top of unit; C-77041, 0.9 m below top of unit C-77042, 1.8 m below top of unit)	2.7	18.2
8	**Limestone:** medium grey, medium to thick bedded, nodular with dolomitic laminae; trilobite fragments common	1.8	15.5
7	Covered interval	7.6	13.7
	Total thickness of Bear Point Formation 50.9 m		
	RABBIT POINT FORMATION (CAMBRIAN)		
6	**Sandstone:** calcareous, light grey, fine grained, medium bedded, abundant *Scolithus* tubes	0.8	6.1
5	**Sandstone:** slightly calcareous, light grey, very fine grained, medium bedded with irregular bedding planes; well sorted, subrounded grains; trace feldspar	0.8	5.3
4	**Sandstone:** calcareous and glauconitic, greenish grey, very fine grained with coarse grained laminae; trace of feldspar and phosphate	0.3	4.5

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
3	Covered interval	1.2	4.2
2	**Sandstone:** calcareous and glauconitic, mottled red and greenish grey, fine to fine grained, poorly sorted, patches of calcite and hematite cement, traces of phosphate and feldspar	0.3	3.0
1	Covered interval	2.7	2.7

Total thickness of Rabbit Point Formation: 6.1 m

Underlying unit: Precambrian gneiss

COMPOSITE STRATIGRAPHIC SECTION B, SVERDRUP INLET - THOMAS LEE INLET - SANDHOOK BAY

Formation	Loc. No.	Description	Field Interval
Allen Bay			
Middle member	53	Mayr	0.0-84.0
Lower member	32	Narbonne	101.4-125.0
Irene Bay	32	Narbonne	91.0-101.4
Thumb Mountain	32	Narbonne	7.2-91.0
Bay Fiord			
Members B-D	31	Narbonne	34.3-184.8
Member A	33	Garagan	0.0-132.8
Eleanor River			
Member D	29	Mayr	22.5-83.5
Members A-C	28	Mayr	0.0-179.0
Eleanor River/Blanley Bay boundary zone	27B	Narbonne	19.9-40.6
Blanley Bay	27A	Narbonne	0.0-154.6
Cape Clay	26	Mayr	12.6-77.0
Cass Fjord	24	Narbonne	28.3-296.3
Bear Point	24	Narbonne	0.0-28.3

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	ALLEN BAY FORMATION Middle member (Silurian)		
	Overlying beds not exposed		
314	**Felsenmeer: dolomite,** light grey, medium crystalline, medium bedded	7.0	1523.2
313	**Dolomite:** light grey, coarsely crystalline, thick to thick bedded, in part labyrinthine mottling; stromatoporoids and colonial corals common	3.7	1516.2
312	**Dolomite:** as in unit 310; interbedded with **dolomite,** coarsely crystalline, medium bedded, laminated and crossbedded (planar, low-angle); coarse-grained skeletal **grainstone**(?)	3.7	1512.5
311	**Dolomite:** very light grey, medium crystalline, medium bedded with internal lamination; unit poorly exposed.	3.6	1508.8
310	**Dolomite:** medium brown-grey, aphanocrystalline, medium bedded, intensely mottled	2.0	1505.2
309	Covered interval	1.5	1503.2
308	**Dolomite:** as in unit 303; intensively burrowed	16.0	1501.7
307	**Dolomite:** light brown, coarsely crystalline, medium bedded; original lithology probably crossbedded; coarse grained skeletal **grainstone.**	1.5	1485.7
306	**Dolomite:** light grey, coarsely crystalline; single bed with internal lamination; **grainstone.**	1.5	1483.7
305	**Dolomite:** as in unit 303		
304	**Dolomite:** light grey, medium and coarsely crystalline, medium bedded, ripple crosslamination and planar parallel lamination; poor exposure	8.0	1482.2
303	**Dolomite:** medium to dark brown, medium crystalline, massive, labyrinthine mottles of coarsely crystalline **dolomite;** small tabular stromatoporoids abundant, spherical stromatoporoids rare	19.0	1474.2
302	**Dolomite:** medium brown, medium crystalline, medium bedded with internal lamination; oolitic **grainstone;** interbedded with light brown stromatolitic **boundstone;** uppermost 2 m consist entirely of stromatolites	16.0	1455.2
301	Interval not examined: estimated thickness based on tentative correlation in Figure 10; boundary between middle and lower members of Allen Bay Formation falls within this interval	189.9	1439.2
	Lower member (Ordovician)		
300	**Limestone:** dolomitic, medium grey, very thick bedded, labyrinthine mottling; skeletal **wackestone;** highly resistant (GSC loc. C-77092, conodonts)	23.6	1226.2
	Measured thickness of Allen Bay Formation: 320.1 m		
	IRENE BAY FORMATION (ORDOVICIAN)		
299	**Limestone:** as in unit 295	0.6	1202.6
298	**Limestone:** argillaceous, medium grey, medium bedded, nodular and wavy; **lime mudstone** and minor skeletal **wackestone;** recessive; rare trilobite and bryozoan fragments	1.1	1202.0
297	**Limestone:** as in unit 295, resistant	0.7	1200.9

Unit	Description	Thickness in metres: Unit	Total from base
296	Covered interval: scree as in unit 294	2.4	1200.2
295	**Limestone:** dolomitic, medium grey, medium bedded, nodular, resistant	1.5	1197.8
294	**Limestone:** argillaceous, medium grey, thin bedded, nodular; **lime mudstone** and skeletal **wackestone**; weathers green-grey, recessive; *Receptaculites* sp. common, solitary rugosa, *Halysites* sp., *Favosites* sp., crinoid fragments rare (GSC loc. C-77090, conodonts)	1.2	1196.3
293	Covered interval	2.9	1195.1
	Total thickness of Irene Bay Formation: 10.4 m		
	THUMB MOUNTAIN FORMATION (ORDOVICIAN) Upper member		
292	**Limestone:** dolomitic, medium grey, thick bedded, wavy bedding; **wackestone**; abundant white **chert** nodules in basal metre; resistant; fossils rare, tabulate and rugose corals, crinoid fragments, orthocones; top of unit is formed by hematite-stained hardground (GSC loc. C-77089, conodonts)	6.0	1192.2
291	**Limestone:** dolomitic, medium grey, very thick bedded, labyrinthine mottling; **wackestone**; semi-resistant	6.4	1186.2
290	**Limestone:** dolomitic, medium grey, thick to very thick bedded, labyrinthine mottling; skeletal **wackestone** (GSC loc. C-77087, conodonts)	3.1	1179.8
289	**Limestone:** dolomitic, medium grey, thick bedded, wavy, minor nodular; skeletal **wackestone**	4.5	1176.7
288	**Limestone:** dolomitic, medium grey, thick to very thick bedded, labyrinthine mottling, minor nodules; **wackestone**; rusty hematite stain on weathered surface; trilobites and brachiopod fragments common, *Receptaculites* sp. and orthocones rare	17.1	1172.2
287	**Limestone:** medium grey, thick bedded; **lime mudstone** and skeletal **wackestone**	1.4	1155.1
286	**Limestone:** dolomitic, medium grey, thin to thick bedded, wavy; **lime mudstone**	1.3	1153.7
285	**Limestone:** medium grey, thick bedded; **lime mudstone**	1.3	1152.4
284	**Limestone:** light brown-buff, thin bedded; **lime mudstone**, rare thin beds of skeletal **wackestone**; resistant (GSC loc. C-77086, conodonts)	4.4	1151.1
	Lower member		
283	**Dolomite:** light buff-brown, very finely crystalline, medium bedded, wavy, resistant	1.3	1146.7
282	**Dolomite:** highly calcareous, light buff-brown, very finely crystalline, medium bedded, wavy, weathers with rusty tinge	1.8	1145.4
281	**Dolomite:** slightly calcareous, medium grey, very finely crystalline, thin bedded, weathers rusty grey-brown	1.4	1143.6
280	**Dolomite:** slightly calcareous, medium grey, very finely crystalline, thin to medium bedded, weathers rusty-grey	0.8	1142.2
279	**Dolomite:** light grey, very finely to finely crystalline, medium bedded with internal lamination; *Planolites* sp. and *Chondrites* common near top	2.9	1141.4

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
278	**Dolomite:** slightly calcareous, yellow-buff, very finely crystalline, medium bedded, dark labyrinthine mottles; *Planolites* sp.	0.5	1138.5
277	**Dolomite:** slightly calcareous, light green, very finely crystalline, thin to medium bedded, mottled; sparite filled vugs	1.1	1138.0
276	**Dolomite:** slightly calcareous, light grey, finely crystalline, medium bedded, vuggy with sparite crystals; abundant *Scolithus* sp., *Planolites* sp., rare *Arenicolites* sp.	1.7	1136.9
275	**Dolomite:** light brown, very finely crystalline, medium bedded, nodular	0.9	1135.2
274	**Dolomite:** light grey, very finely crystalline, medium bedded; patterned carbonate and sparite-filled vugs	1.5	1134.3
273	**Dolomite:** light grey, very finely crystalline, thick bedded, mottled; abundant sparite-filled vugs	3.0	1132.8
272	**Dolomite:** light grey, very finely crystalline, medium bedded	3.0	1129.8
271	**Dolomite:** slightly calcareous, medium grey, thick bedded, labyrinthine mottling, some wavy bedding; *Chondrites* sp. abundant	2.8	1126.8
270	**Dolomite:** as in unit 268	1.2	1124.0
269	**Limestone:** dolomitic, medium grey-buff, thick bedded, labyrinthine mottling; **lime mudstone,** thin lenses of intraclastic and skeletal **wackestone;** abundant white **chert** nodules; *Planolites* sp. (GSC loc. C-77083, conodonts, 2.1 m above base)	7.5	1122.8
268	**Dolomite:** very light grey, very finely crystalline, thin to medium bedded	2.4	1115.3
267	**Dolomite:** calcareous, medium grey-brown, medium crystalline, massive, nodular, burrowed, resistant, weathers medium rusty grey-brown	4.5	1112.9
	Total thickness of Thumb Mountain Formation: 83.8 m		
	BAY FIORD FORMATION (ORDOVICIAN)		
	Member D		
266	Covered interval	21.0	1108.4
265	**Dolomite:** medium to dark grey, finely crystalline, medium to thick bedded, mottled, resistant	2.0	1087.4
264	Covered interval	14.8	1085.4
263	**Dolomite:** medium to dark grey, very finely to aphanocrystalline; very thin bedded, interbedded with minor thin to medium bedded; friable, recessive	13.5	1070.6
	Member C		
262	**Dolomite:** medium to dark grey, finely crystalline, very thick bedded; resistant, weathering dark grey-buff; *Chondrites* sp. burrows common	3.0	1057.1
261	**Dolomite:** medium to dark grey, very finely to finely crystalline, thick bedded, resistant, weathers light buff; abundant *Chondrites* sp. burrows	2.2	1054.1
260	**Dolomite:** medium to dark grey, very finely crystalline, medium bedded, weathers light buff	1.1	1051.9
259	**Dolomite:** medium to dark grey, medium bedded; intraclastic **floatstone,** 0.3 by 1.0 cm clasts; resistant	0.5	1050.8

Unit	Description	Thickness in metres: Unit	Total from base
258	**Dolomite:** as in unit 256; *Planolites* sp. common; resistant	3.2	1050.3
257	Covered interval	1.2	1047.1
256	**Dolomite:** medium to dark grey, finely crystalline, thick bedded, resistant, weathers light grey-buff	0.6	1045.9
255	**Limestone:** dolomitic, medium grey, thin to very thin bedded, mottled; **lime mudstone** and **wackestone;** semi-resistant; brachiopods common, trilobites rare (GSC loc. C-77080, macrofossils, C-77081, conodonts)	1.8	1045.3
254	**Dolomite:** light to medium grey, very finely crystalline, thin bedded	1.5	1043.5
253	**Dolomite:** highly calcareous, medium grey-buff, very thin to thin bedded, wavy; skeletal **wacke-** and **pack-stone;** minor very thin **siltstone** interbeds with abundant *Chondrites* sp.; semi-resistant; fossils common, bryozoans, brachiopods, crinoid fragments, trilobite fragments, solitary corals; (GSC loc. C-77078, conodonts); units 253 to 262 form a prominent, resistant marker in the upper part of the Bay Fiord Formation	3.5	1042.0
	Member B		
252	**Dolomite:** as in unit 250; very thin interbeds of black **shale;** recessive	2.9	1038.5
251	**Dolomite:** medium grey, very finely crystalline, thin bedded, semi-recessive	0.3	1035.6
250	**Dolomite:** medium to dark grey, very finely to finely crystalline, very thin bedded; black **shale** partings; recessive	3.0	1035.3
249	**Dolomite:** silty, medium grey, finely crystalline, medium bedded, vuggy	1.0	1032.3
248	**Dolomite:** as in unit 246; interbedded with gypsiferous **dolomite** and interlaminated with **gypsum** as in unit 247 (20%), interbedded with **shale** (10%), rare gypsiferous nodules	21.3	1031.3
247	**Dolomite:** gypsiferous, medium grey-buff, halite casts, synaeresis cracks; interlaminated and interbedded with **gypsum;** also interbedded with **dolomite,** medium grey, finely crystalline; very thin bedded	10.5	1010.0
246	**Dolomite:** as in unit 233 (85%); very thin bedded; interbedded with **dolomite** as in unit 235; small, pink **gypsum** nodules; one very thin bed of intraclasts; highly recessive	17.3	999.5
245	**Dolomite:** as in unit 233 (50%); interbedded with **dolomite** as in unit 235; also interbedded with **dolomite,** gypsiferous, ripple marks, halite casts and gypsum laminae	6.0	982.2
244	**Dolomite:** as in unit 235	1.1	976.2
243	**Dolomite:** as in unit 233	2.9	975.1
242	**Dolomite:** gypsiferous; interlaminated with **gypsum,** one silty bed with ripple marks, halite casts and synaeresis cracks (GSC loc. C-77077, X-ray analysis)	1.5	972.2
241	**Dolomite:** as in unit 233	0.3	970.7
240	**Dolomite:** as in unit 235	0.6	970.4
239	**Dolomite:** gypsiferous; interlaminated with **gypsum**	0.2	969.8
238	**Dolomite:** as in unit 233		

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
237	**Dolomite:** gypsiferous, medium grey-brown, very finely crystalline, medium bedded; lenses and laminae of **gypsum;** interbedded with **shale** (30%), black, thinly laminated; interbedded with **dolomite** (30%), medium grey-brown, very finely crystalline; algal lamination	3.0	967.6
236	**Shale:** black, thinly laminated; contains abundant **dolomite** concretions	0.5	964.6
235	**Dolomite:** medium grey-buff, very finely crystalline, medium bedded, patterned carbonate; single beds of intraclast **grainstone,** gypsiferous; laminated, ripple marks (GSC loc. C-77076, thin section, Fig. 48)	2.3	964.1
234	**Dolomite:** medium grey, very finely crystalline, very thin to thin bedded; vugs with **gypsum;** recessive	0.9	961.8
233	**Dolomite:** medium grey, very finely crystalline, very thin bedded; one bed of gypsiferous **dolomite** and **gypsum** laminae; very recessive	3.0	960.9
	Member A		
232	**Dolomite** and **gypsum:** as in unit 209	2.3	957.9
231	**Dolomite:** dark grey, very finely crystalline, thin to medium bedded; dark-grey **shale** in upper part, gypsum-filled cracks; recessive	0.7	955.6
230	**Dolomite** and **gypsum:** as in unit 209	0.5	954.9
229	**Dolomite:** medium grey, very finely crystalline, thin to medium bedded; interbedded with **gypsum;** semi-recessive, weathers greenish grey	1.6	954.4
228	**Dolomite:** argillaceous, medium grey, very finely crystalline, very thin bedded; interbedded with **gypsum** (40%), very thin bedded	2.4	952.8
227	**Dolomite:** dark grey, very finely crystalline, thin to medium bedded, weathers light grey, semi-recessive	0.3	950.4
226	**Dolomite** and **gypsum:** as in unit 209; rare **chert** nodules	0.6	950.1
225	**Dolomite:** as in unit 223	4.0	949.5
224	**Dolomite** and **gypsum:** as in unit 209	0.7	945.5
223	**Dolomite:** argillaceous, light brown, very finely crystalline, very thin bedded; selenite on bedding planes and in fractures	0.3	944.8
222	**Dolomite:** medium brown, very finely crystalline, thin bedded, weathers green-grey, semi-recessive	0.7	944.5
221	**Dolomite** and **gypsum:** as in unit 209; **gypsum** nodules	0.5	943.8
220	**Dolomite:** argillaceous, medium brown, very thin to medium bedded; inter-bedded with 20 cm thick **gypsum** units, selenite in fractures	8.0	943.3
219	**Dolomite** and **gypsum:** as in unit 209	0.5	935.3
218	**Dolomite:** light brown-grey, very finely crystalline, thin to medium bedded; thin bed of black **shale**	2.8	934.8
217	**Dolomite** and **gypsum:** as in unit 209	0.3	932.0
216	**Dolomite:** medium brown, very finely crystalline, thin to medium bedded	0.5	931.7
215	**Gypsum:** white, thin bedded; minor interbeds of **dolomite,** light grey, very finely crystalline, thin bedded	6.1	931.2

Unit	Description	Thickness in metres: Unit	Total from base
214	**Dolomite:** light grey, very finely crystalline, thin bedded, halite casts; selenite along bedding planes and in fractures	0.5	925.1
213	Covered interval	1.0	924.6
212	**Dolomite:** medium grey-brown, very finely crystalline, thin to medium bedded	2.3	923.6
211	**Dolomite** and **gypsum:** as in unit 209	4.0	921.3
210	Covered interval	2.5	917.3
209	**Dolomite:** argillacous, light grey brown, very finely crystalline, very thin bedded; interlaminated with **gypsum** (35%)	1.0	914.8
208	**Dolomite:** light grey, very finely crystalline, thin to medium bedded; 15 cm **gypsum** in middle part of unit, very thin bedded	0.9	913.8
207	**Dolomite:** argillaceous, medium grey-brown, very finely crystalline, very thin bedded; interlaminated **gypsum** (35%), light grey **shale** in upper part of unit	9.0	912.9
206	**Dolomite:** medium grey, thin bedded; **gypsum** and **shale** interbeds in lower part; in uppermost part 50 cm of gypsiferous solution **breccia**	3.1	903.9
205	**Dolomite:** medium grey, thin bedded; interbedded with minor black **shale** and **gypsum,** thin bed of solution **breccia**	2.7	900.8
204	**Dolomite:** medium grey, thin bedded; interlaminated with **gypsum,** black **shale** at base	0.8	898.1
203	**Dolomite:** light brown, very thin bedded; interlaminae of **gypsum** (30%)	0.6	897.3
202	**Gypsum:** white, thin bedded	0.7	896.7
201	Covered interval	2.1	896.0
200	**Gypsum:** white, thin bedded; single **dolomite** bed in upper part	0.8	893.9
199	Covered interval	1.5	893.1
198	**Dolomite:** medium grey, very finely crystalline, very thin bedded	6.2	891.6
197	**Gypsum:** white, thin bedded; laminae of **dolomite**	0.9	885.4
196	Covered interval	1.6	884.5
195	**Gypsum:** white, medium bedded	1.4	882.9
194	**Dolomite:** argillaceous, medium grey, very finely crystalline, very thin bedded; **gypsum** interbed in lower part, gypsum laminae	2.7	881.5
193	**Gypsum:** white, thin to medium bedded	0.9	878.8
192	**Dolomite:** argillaceous, medium grey, very finely crystalline, thin bedded; minor gypsum laminae	1.1	877.9
191	**Gypsum:** white, thin bedded; black **shale** laminae	2.1	876.8
190	Covered interval	7.7	874.7
189	**Gypsum:** white, thick bedded	5.8	867.0
188	**Gypsum:** white, thin bedded	0.5	861.2
187	Covered interval	2.5	860.7

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
186	**Gypsum:** white, thick bedded	26.7	858.2
185	**Gypsum:** white, thin bedded; black **shale** in lower part, **dolomite** bed in upper part	0.7	831.5
184	**Gypsum:** light brown, very thin bedded	4.5	830.8
	Total thickness of Bay Fiord Formation: 282.1 m		
	ELEANOR RIVER FORMATION (ORDOVICIAN) Member D		
183	Interval not examined in detail. Poorly exposed (GSC loc. C-79440, conodonts)	31.5	826.3
182	**Dolomite:** calcareous, medium brown, medium crystalline, thin bedded with zones of lamination; interbedded with brown **lime mudstone laminite,** abundant **chert** nodules	12.8	794.8
181	**Limestone:** medium brown, finely laminated; **lime mudstone,** dedolomitized euhedrons (GSC loc. C-77239, conodonts, C-77238, thin section, Fig. 47)	3.0	782.0
180	**Limestone:** dolomitic, dark brown; laminated, interbeds of labyrinthine mottled units; **lime mudstone;** grading upward into light grey, finely laminated **lime mudstone**	1.1	779.0
179	**Limestone:** dolomitic, dark brown, laminated (?algal); **lime mudstone;** grading up into finely laminated, white **lime mudstone;** abundant bands of white **chert** nodules	1.5	777.9
178	**Limestone:** medium grey, thin bedded; **grainstone** of pelletoidal and composite grains, leached intragranular porosity; very rare brachiopod fragments	2.1	776.4
177	**Dolomite:** light brown, medium crystalline, laminated to very thin bedded, planar crosslamination, rare trough crossbeds; upper boundary erosional	1.5	774.3
176	**Dolomite:** dark brown, medium crystalline, massive, labyrinthine mottling, laminated in upper part (GSC loc. C-79439, conodonts)	3.3	772.8
175	**Limestone:** dolomitic, light grey, laminated to very thin bedded, planar crossbeds and small channels; pelletal **grainstone** with **dolomite** laminae; intergranular porosity	2.7	769.5
174	**Dolomite:** slightly calcareous, dark brown, medium to finely crystalline, very thin bedded, some lamination and labyrinthine mottling, weathers rubbly, semi-recessive	1.5	766.8
	Member C		
173	Covered interval: thickness estimated	46.0	765.3
172	**Limestone:** medium brown-grey, thick bedded, dolomitic lamination; intraclast **grainstone,** fine **calcirudite,** intraclasts of pelletal **grainstone,** some skeletal grains, porosity (GSC loc. C-77229, conodonts; C-77228, thin section, Fig. 44)	4.4	719.3
171	**Limestone:** dolomitic, medium brown-grey, medium to thick bedded, nodular, labyrinthine mottles; **lime mudstone** with skeletal fragments; white **chert** nodules; resistant	12.0	714.9

Unit	Description	Thickness in metres: Unit	Total from base
	Member B		
170	**Dolomite:** calcareous, light grey-brown, finely crystalline, thin bedded; interlaminated with **limestone**; green shaly units in lower part, rare beds of flat-pebble **conglomerate**; small SHV and LLH stromatolites in scree; recessive	31.0	702.9
169	**Shale:** dolomitic, medium green	2.1	671.9
168	**Limestone:** dolomitic, dark grey; very regularly interlaminated with **dolomite**; very uniform **laminite**; flat-pebble **conglomerate** in uppermost part	1.0	669.8
167	Covered interval: evaporitic **dolomite**(?)	3.3	668.8
166	**Carbonate:** various types interbedded: 1. **Limestone:** dark brown-grey, regularly laminated with **dolomite**; forms about 50% of unit 2. **Dolomite:** light grey-brown, thick bedded, patterned carbonate 3. **Limestone** beds with LLH stromatolites 4. Rare flat-pebble **conglomerate**	10.9	665.5
165	Covered interval	3.0	654.6
164	**Dolomite:** slightly calcareous, light grey-brown, finely crystalline, thin to very thin bedded, internal lamination, weathers white	6.0	651.6
163	**Limestone:** medium brown, thin and regular lamination; very pure **lime mudstone**; rare interbeds of medium bedded, slightly nodular, brown **limestone**	2.9	645.6
162	**Limestone:** slightly dolomitic, dark brown-grey, medium bedded with internal very thin bedding, nodular, dolomitic lamination and mottling	7.3	642.7
161	**Limestone:** very slightly silty, dark grey, thin bedded, laminated, cross-lamination; detrital **calcilutite** (GSC loc. C-77226, thin section, Fig. 42)	4.5	635.4
160	**Dolomite:** silty and argillaceous, slightly calcareous, green-grey, very finely crystalline, very thin bedded, abundant desiccation cracks; prominent recessive unit	6.0	630.9
159	**Limestone:** dark brown; medium bedded; interbedded with **dolomite** as in unit 158 and **limestone** as in unit 140, thin, flat-pebble **conglomerate** on top of unit	3.1	624.9
158	**Dolomite:** slightly calcareous, light grey-brown, finely crystalline; single bed; similar to unit 155	0.9	621.8
157	**Limestone:** medium brown; thin to very thin bedded, nodular; **lime mudstone**; interbeds of skeletal **packstone**; bed of stromatolites in lower part	5.2	620.9
156	**Limestone:** as in unit 150; anhydrite laminae and large **chert** nodules; interbeds of green platy **dolomite** and green **shale**; algal lamination; bed of skeletal debris 1.5 m below top (GSC loc. C-77224, conodonts)	6.0	615.7
155	**Dolomite:** silty, light grey, finely crystalline; single bed	1.1	609.7
154	**Limestone:** medium brown, thick bedded, load casting and slumping in upper part; very pure **lime mudstone**	2.0	608.6
153	**Limestone:** as in unit 139; medium bedded	0.8	606.6
152	Covered interval	1.3	605.8
151	**Limestone:** as in unit 139; medium bedded	2.3	604.5

Unit	Description	Thickness in metres: Unit	Total from base
150	**Limestone:** very slightly silty, dolomitic, dark grey, very thin bedded to laminated, desiccation cracks; pelletal **packstone** and detrital **calcilutite;** thin interbeds of patterned carbonate; algal lamination and fenestral vugs (GSC loc. C-77222, thin section, Fig. 43)	6.5	602.2
149	Covered interval	2.1	595.7
148	**Limestone:** dolomitic, dark grey, regularly thin and very thin bedded, dolomitic lamination, weathers very light grey, platy, semi-resistant	1.5	593.6
147	**Limestone:** as in unit 239; resistant	2.9	592.1
146	**Limestone:** chalky, very light grey-brown, thin to very thin bedded; clotted **lime mudstone,** porous	0.4	589.2
	Member A		
145	**Limestone:** as in unit 139; discontinuous thin beds of skeletal **wackestone** and intraclast **grainstone**	40.1	588.8
144	**Limestone:** as in unit 140	1.2	548.7
143	**Limestone:** as in unit 139	1.4	547.5
142	**Limestone:** as in unit 140, slightly dolomitic	0.5	546.1
141	**Limestone:** as in unit 139; thick bedded; hardground at top; rare solitary corals	2.3	545.6
140	**Limestone:** dolomitic, medium grey, very thin bedded, nodular, argillaceous-dolomitic partings	0.4	543.3
139	**Limestone:** dolomitic, medium brown, massive, labyrinthine mottling, burrows; **lime mudstone** with minor skeletal fragments; resistant (GSC loc. C-77400, conodonts)	2.6	542.9
138	Covered interval: thickness estimated	4.3	540.3
137	**Limestone:** medium dark grey, medium to thick bedded, mottled in upper part; intraclast **packstone,** shelly in upper part; lower boundary an erosional surface (hardground) with about 20 cm relief, depressions infilled with fragments of unit 136, high points with small SH stromatolites; weathers resistant	0.7	536.0
	Total thickness of Eleanor River Formation: 291.0 m		
	BLANLEY BAY FORMATION (ORDOVICIAN) Upper member		
136	**Shale:** evaporitic, medium grey, very thinly laminated; interbedded with minor flat-pebble **conglomerate;** recessive	1.4	535.3
135	Covered interval	18.0	533.9
134	**Dolomite:** medium grey, very finely crystalline, very thin bedded, patterned carbonate common, recessive	0.5	515.9
133	**Dolomite:** very light grey, finely crystalline, thin to medium bedded, some beds very sandy, locally vuggy, rare chert nodules; rare SH stromatolites (1.0 m wide), very rare gastropods (GSC loc. C-77073, conodonts)	3.6	515.4
132	**Dolomite:** very light grey, finely crystalline, thin to medium bedded; some sandy beds	7.0	511.8

Unit	Description	Thickness in metres: Unit	Total from base
131	Poorly exposed unit. Predominantly **sandstone:** very light grey, medium to coarse grained, thin bedded, high-angle planar crossbeds, desiccation cracks; moderately consolidated, mature **quartz arenite;** interbedded with oolitic **wacke-** and **pack-stone,** sandy, thin bedded; interbedded with **dolomite,** finely to medium crystalline, thin to medium bedded	36.0	504.8
130	**Evaporitic shale** and minor **dolomite:** as in unit 128	0.9	468.8
129	**Dolomite:** light grey-buff, medium crystalline, laminated, recrystallized stromatolitic **boundstone;** gypsiferous **shale** between SH stromatolites	2.1	467.9
128	**Shale:** evaporitic, medium grey, very thinly laminated; interbedded with minor **dolomite,** medium grey, very finely crystalline, very thin bedded (GSC loc. C-77070, X-ray analysis)	1.5	465.8
127	**Dolomite:** medium grey, finally crystalline, thin bedded, rare SH stromatolites	1.4	464.3
126	**Dolomite:** medium grey-brown, medium crystalline, very thick bedded, stylolites, vuggy	2.0	462.9
125	**Dolomite:** medium brown, medium crystalline, medium bedded, rare desiccation cracks, vuggy, minor interbeds of flat-pebble **conglomerate**	2.2	460.9
124	**Dolomite:** silty to very sandy, medium grey-brown, fine to medium crystalline, medium bedded, rare desiccation cracks, (?)patterned carbonate, rare small SH stromatolites	2.1	458.7
123	**Dolomite:** medium grey-brown; stromatolitic **boundstone;** low LLH heads, 0.8 m wide	0.4	456.6
122	**Dolomite:** medium to dark grey brown, medium crystalline, medium bedded; thin, wispy, silt laminae	0.5	456.2
121	**Dolomite:** medium to dark grey-brown, medium crystalline, thick bedded, semi-recessive	1.0	455.7
120	Covered interval. Scree predominantly **dolomite:** finely crystalline, medium to thick bedded	42.0	454.7
	Lower member		
119	**Dolomite:** medium grey, finely crystalline, medium to thick bedded, rare vugs, chert nodules, semi-resistant	3.4	412.7
118	**Dolomite:** medium grey to grey-brown, finely crystalline; medium bedded; rare vugs; weathers very light grey, semi-resistant	2.5	409.3
117	**Dolomite:** medium grey-brown, very finely to finely crystalline, thin to medium bedded, patterned carbonate, rare vugs; interbedded with minor flat-pebble **conglomerate** and laminated, dolomitic **siltstone**	3.8	406.8
116	Covered interval	1.4	403.0
115	**Dolomite:** slightly calcareous and silty, very light grey, medium to thick bedded, patterned carbonate, vugs common; thin interbed of intraclast **floatstone**	2.4	401.6
114	**Dolomite:** medium grey-brown, very finely crystalline, thin bedded	1.8	399.2
113	**Dolomite:** very silty, slightly sandy, medium to dark grey, finely crystalline, very thin bedded, minor laminated; lenses of flat-pebble **conglomerate**	4.5	397.4
112	Covered interval	9.0	392.9

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
111	**Dolomite:** medium grey-brown, finely crystalline, medium bedded, minor thin beds; rare **chert**; *Planolites* sp. locally common	2.4	383.9
110	Covered interval	20.8	381.5
	Total thickness of Blanley Bay Formation: 174.6 m		
	CAPE CLAY FORMATION (ORDOVICIAN)		
109	**Dolomite:** as in unit 103; resistant	2.0	360.7
108	**Dolomite:** light brown, medium crystalline, thick bedded; **grainstone**	0.8	358.7
107	**Dolomite:** as in unit 103; resistant	15.3	357.9
106	**Dolomite:** light brown, medium crystalline, thin bedded, very uniform, internal lamination; (?)**grainstone**	3.6	342.6
105	**Dolomite:** as in unit 103; vuggy	4.3	339.0
104	**Dolomite:** light brown, medium crystalline, medium to thick bedded; vague internal, very thin, wavy and nodular bedding; rare brown **chert** nodules; slightly recessive	18.0	334.7
103	**Dolomite:** light brown, medium crystalline, massive, intense labyrinthine mottling with very light brown dolomite; resistant	12.0	316.7
102	**Dolomite:** as in unit 101; abundant white **chert** nodules; resistant	4.0	304.7
101	**Dolomite:** light brown, medium crystalline, very thick bedded, slight labyrinthine mottling, rare nodules of white **chert**; resistant	4.4	300.7
	Total thickness of Cape Clay Formation: 64.4 m		
	CASS FJORD FORMATION (ORDOVICIAN-CAMBRIAN)		
	Member D		
100	**Dolomite:** calcareous, medium grey, finely crystalline, medium bedded, mottled, resistant, weathers rubbly locally (GSC loc. C-77096, conodonts)	10.5	296.3
99	**Dolomite:** calcareous, medium grey, very finely crystalline, medium bedded; very thin argillaceous seams; unit sandy at base; interbedded with flat-pebble **conglomerate** (2-4 cm pebble length); brachiopods at base (GSC loc. C-77067, conodonts)	2.2	285.8
	Member C		
98	**Sandstone:** dolomitic, light grey-buff, medium grained, thick bedded, abundant low and high angle planar crossbeds; **quartz arenite**; single bed of **dolomite** in upper part; semi-resistant	2.8	283.6
97	**Dolomite:** as in unit 80; interbedded with **dolomite** as in unit 88; recessive	5.3	280.8
96	**Sandstone:** very light buff, medium grained; **quartz arenite**; interbedded with **siltstone** as in unit 80	0.4	275.5
95	**Shale:** as in unit 93; interbedded with minor **dolomite** as in unit 88; one thin bed of flat-pebble **conglomerate** (GSC loc. C-77066, conodonts)	4.5	275.1
94	**Dolomite:** light grey, medium crystalline; medium bedded; flat-pebble **conglomerate**, stromatolites, abundant grey **chert** nodules at top; vuggy	1.6	270.6

Unit	Description	Thickness in metres: Unit	Total from base
93	**Shale:** silty, medium grey; thinly laminated; single bed of flat-pebble **conglomerate**	4.0	269.0
92	**Dolomite:** as in unit 80	0.6	265.0
91	**Conglomerate:** thin bedded; dolomite-pebble **conglomerate** with medium grained **quartz arenite** matrix; erosional base	0.3	264.4
90	**Sandstone:** light grey, very fine grained at base, coarsening upward to medium grained; medium bedded; **quartz arenite**	0.7	264.1
89	**Dolomite:** as in unit 80	1.1	263.4
88	**Dolomite:** medium grey, aphanocrystalline, medium bedded	0.9	262.3
87	Covered interval	0.7	261.4
86	**Sandstone:** light buff, medium grained; thin bedded, ripple crosslamination, planar crossbedding; **quartz arenite;** moderately consolidated	0.9	260.7
85	**Siltstone:** as in unit 80; one thin bed of patterned carbonate	1.2	259.8
84	**Dolomite:** very sandy, dark grey, fine grained, medium bedded; very coarse grained **quartz arenite** at top	0.5	258.6
83	Poorly exposed unit. Predominantly **sandstone:** dolomitic, fine to medium grained, thin bedded; interbedded with oolitic **grain- and pack-stone** (35%), very thin to thin bedded; rare ostracode and gastropod fragments	15.9	258.1
82	**Dolomite:** dark grey, medium crystalline, medium bedded; in lower part relict structures of small club-shaped stromatolites; middle and upper part very sandy, uppermost part oolitic **grainstone;** resistant	2.7	242.2
81	**Dolomite:** light grey, aphanocrystalline; very thin bedded	0.7	239.5
80	**Dolomite:** silty, medium grey, finely crystalline, laminated; detrital (GSC loc. C-77063, X-ray analysis)	0.6	238.8
79	**Dolomite:** dark grey, medium bedded; oolitic and oncolitic **grain-** and **pack-stone**	0.9	238.2
78	**Dolomite:** as below in unit 77; thin to medium bedded; interbedded with detrital **dolosiltite**	3.0	237.3
77	**Dolomite:** dark grey, medium crystalline, medium to thick bedded; minor oolitic **pack-** and **wacke-stone** at base; rare vugs; resistant	4.1	234.3
76	**Dolomite:** interbedded complex of oolitic **grainstone,** variably sandy **mudstone,** stromatolitic **boundstone,** coarse grained **quartz arenite;** planar and trough crossbeds, desiccation cracks; *Planolites* sp.	4.5	230.2
75	**Dolomite:** medium to dark grey, medium crystalline, medium bedded, good porosity; interbedded with **shale,** very silty, medium grey to grey-brown	2.8	225.7
74	**Sandstone:** very light grey, fine grained, medium bedded, desiccation cracks, low angle trough crossbeds; semi-resistant	0.8	222.9
	Member B		
73	**Shale:** as in unit 52, abundant desiccation polygons; interbedded with **dolomite** (10%); recessive	6.9	222.1
72	**Shale:** as in unit 52; interbedded with **dolomite** (30%)	7.5	215.2

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
71	**Zone of bioherms:** as in unit 69, 2-3 m bioherms	1.5	207.7
70	**Shale** and **dolomite:** as in unit 52	1.0	206.2
69	**Zone of bioherms:** bioherms 1 m by 2-5 m, closely spaced, linked at bases; composed of finely crystalline, massive, vuggy **dolomite; shale** between bioherms	1.2	205.2
68	**Shale** and **dolomite:** as in unit 52	5.7	204.0
67	**Dolomite:** very light grey, finely crystalline, very thin bedded; interbedded with flat-pebble **conglomerate**, intraclast **grainstone** (30%), and stromatolitic **boundstone** (10%); small SH and LLH stromatolites	1.5	198.3
66	**Shale** and **dolomite:** as in unit 52	4.0	196.8
65	**Zone of stromatolitic bioherms:** 3 m by 5-6 m; partly recrystallized, separated by grey **shale** and **dolomite** as in unit 52	3.0	192.8
64	**Shale** and **dolomite:** as in unit 52	9.0	189.8
63	**Zone of stromatolitic bioherms:** bioherms are 4-5 m by 10-12 m; composed of clubshaped 7-10 cm high stromatolites; separated by **shale** in unit 52	4.5	180.8
62	**Shale:** highly evaporitic, dark brown-grey, thinly laminated	2.0	170.3
61	**Shale:** as in unit 52; one thin bed of dolomitic, fine grained **quartz arenite**, and one thin bed of black **chert**	5.0	174.3
60	**Dolomite:** stromatolitic **boundstone** as in unit 55; clubshaped stromatolites; flat-pebble **conglomerate** between stromatolite heads	1.0	169.3
59	**Shale:** as in unit 52	0.4	167.8
58	**Flat-pebble conglomerate:** edgewise	0.5	166.9
57	**Dolomite:** as in unit 53	2.1	166.4
56	**Shale** and **dolomite:** as in unit 52	0.5	164.3
55	**Dolomite:** medium grey; stromatolitic **boundstone;** club-shaped 6-7 cm high stromatolites; unit varies in thickness laterally	0.3	163.8
54	**Dolomite:** argillaceous; thin bedded, wavy; recessive	1.0	163.5
53	**Dolomite:** light grey, finely crystalline, thick bedded, semi-resistant	4.5	162.5
52	**Shale:** medium grey, thinly laminated (GSC loc. C-77057, X-ray analysis); interbedded with minor **dolomite,** light grey buff, finely crystalline, thin bedded; single bed of flat-pebble **conglomerate;** recessive		
	Member A		
51	**Sandstone:** dolomitic, very light grey, very fine grained, medium to thin bedded, ripple marks, flute marks; gradational to finely crystalline, sandy **dolomite;** semi-resistant	5.3	158.0
50	**Dolomite:** light grey, finely crystalline, thin bedded, rare desiccation polygons; semi-resistant	9.0	152.7
49	**Sandstone:** slightly dolomitic and argillaceous, medium to dark grey, very fine grained, very thin bedded to laminated	2.5	143.7

Unit	Description	Thickness in metres	Total from base
48	**Dolomite:** light buff, finely crystalline, thin bedded, possibly detrital; rare *Skolithos* sp.	2.1	141.2
47	**Dolomite:** as in unit 46; interbedded with vuggy **dolomite** as in unit 35 and grey **shale**	4.1	139.1
46	**Dolomite:** medium grey, aphanocrystalline, medium bedded, internal thin lamination (algal?), desiccation cracks	2.4	135.0
45	**Dolomite:** medium grey, very finely crystalline, thin bedded; interbedded with **shale,** purple, laminated, rare desiccation cracks	5.1	132.6
44	**Dolomite:** predominantly as in unit 43; rare flat-pebble **conglomerate;** abundant desiccation cracks; interbedded with minor **shale,** medium grey or purple; interbedded with minor **sandstone,** very light grey, very fine grained, thin bedded; recessive; unit capped by thick bed of vuggy **dolomite** as in unit 35	5.0	127.5
43	**Dolomite:** medium grey with purple blotches, very finely crystalline to aphanocrystalline, medium bedded, desiccation cracks; thin interbeds of green and purple **shale**	8.0	122.5
42	**Dolomite:** as in unit 35; interbedded with dolomite (30%), medium purple-grey, very finely crystalline, very thin bedded to laminated; unit weathers purple	3.5	114.5
41	**Dolomite:** as in unit 39; rare synaeresis cracks; *Planolites* sp. and *Chondrites* sp.	1.0	111.0
40	**Dolomite:** very light grey, finely crystalline, thin bedded, ripple marks, tool marks, flow structures; probably detrital **dolosiltite;** green **shale** partings	1.0	110.0
39	**Dolomite:** light buff, finely crystalline, medium bedded, desiccation cracks, ripple marks, small scour marks; interbedded with flat-pebble **conglomerate** (30%), as in unit 16; trace fossils (*Planolites* sp. and *Palaeophycus* sp.) common	3.1	109.0
38	**Dolomite:** as in unit 34	2.5	105.9
37	**Dolomite:** as in unit 35	1.2	103.4
36	**Dolomite:** medium grey, very finely crystalline, very thin bedded; rare, very small *Planolites* sp.	1.0	102.2
35	**Dolomite:** medium to dark grey, medium crystalline, thick bedded, vuggy	0.6	101.2
34	**Dolomite:** medium grey, very finely to aphanocrystalline; thin bedded	1.0	100.6
33	**Dolomite:** as in unit 31	4.8	99.6
32	**Shale:** as in unit 12; interlaminated with very finely crystalline **dolomite** (25%); interbedded with **quartz arenite** (10%), as in unit 25	5.8	94.8
31	**Dolomite:** medium grey, very finely crystalline; very thin, irregularly bedded; ripple marks; interbedded with minor flat-pebble **conglomerate,** very thin **shale** partings	8.5	89.0
30	Covered interval	7.5	80.5
29	**Dolomite** and **shale** (20%): as in unit 26; **gypsum** molds	4.5	73.0
28	**Dolomite:** argillaceous, single bed, nodular	0.6	68.5
27	**Sandstone:** as in unit 25	0.2	67.9

Unit	Description	Thickness in metres: Unit	Total from base
26	**Flat-pebble conglomerate:** 3-6 cm clasts; medium to thick bedded, erosional bases; interbedded with **dolomite,** finely crystalline and minor **shale** as in unit 12	3.0	67.7
25	**Sandstone:** dolomitic; single bed, erosional base; mature **quartz arenite;** minor intraclasts	0.2	64.7
24	**Dolomite:** medium grey, medium to thick bedded; one very thin bed of flat-pebble **conglomerate**	1.5	64.5
23	**Shale:** as in unit 12; interbedded with **dolomite** (15%), medium grey, finely crystalline, thin to medium bedded; minor flat-pebble **conglomerate**	2.8	63.0
22	**Dolomite:** as in unit 19	0.6	60.2
21	**Sandstone:** dolomitic, medium grey, medium to coarse grained, thin bedded; **sublitharenite** with dolomite grains, quartz grains, well sorted and rounded	0.3	59.6
20	**Flat-pebble conglomerate:** as in unit 19; medium bedded	1.7	59.3
19	**Dolomite:** medium purple-grey, very finely crystalline, very thin bedded, very rare desiccation cracks; very thin interbeds of purple **shale;** interbeds of flat-pebble **conglomerate,** 1-2 cm clasts, very thin bedded	1.8	57.6
18	**Dolomite:** medium grey, very finely crystalline to aphanocrystalline, very thin bedded; weathers purple locally	5.5	55.8
17	**Dolomite:** medium grey, coarsely crystalline, thick bedded, vuggy	1.0	50.3
16	**Dolomite:** medium grey, very finely crystalline, very thin bedded; **shale** partings and rare very thin **shale** interbeds; interbedded with minor flat-pebble **conglomerate,** 3-6 cm clasts, medium to thick bedded, erosional bases; semi-resistant	12.2	49.3
15	Poorly exposed unit. Probably **shale** and **dolomite** as in unit 12	2.0	37.1
14	**Dolomite:** medium grey, very finely crystalline, thin to very thin bedded; sandy beds with ripple marks; interbedded with minor flat-pebble **conglomerate**	1.3	35.1
13	**Sandstone:** dolomitic, light grey, thin bedded, ripple marks, semi-recessive	1.0	33.8
12	**Shale:** dolomitic, thinly laminated; interbedded with minor **dolomite,** very thin to thin bedded; recessive; base not exposed	4.5	32.8

Total thickness of Cass Fjord Formation: 268.0 m

BEAR POINT FORMATION (CAMBRIAN)
Upper member

11	**Dolomite:** very light grey, medium to coarsely crystalline, very thick bedded, weathers resistant, pink-orange	1.0	28.3
10	**Dolomite:** medium grey, finely crystalline, very thick bedded, labyrinthine mottling, weathers resistant, orange-buff	7.0	27.3
9	**Dolomite:** medium grey, finely crystalline, thin bedded with internal thin lamination	1.5	20.3
8	**Dolomite:** as in unit 4	6.0	18.8
7	**Sandstone:** as in unit 5	0.2	12.8

Unit	Description	Thickness in metres: Unit	Total from base
6	**Dolomite:** as in unit 4	1.0	12.6
5	**Sandstone:** highly dolomitic and glauconitic, medium green, very thin bedded	0.3	11.6
4	**Dolomite:** glauconitic, very light grey, coarsely crystalline, very thick bedded, very vuggy	3.0	11.3
3	**Sandstone:** conglomeratic, very light grey, fine grained, thin to medium bedded, **chert** pebbles	0.6	8.3
2	**Dolomite:** medium grey-buff, very finely crystalline, thin to medium bedded, rubbly weathering	0.7	7.7
	Lower member		
1	Covered interval: poorly exposed green **shale** in vicinity	7.0	7.0
	Total thickness of Bear Point Formation: 28.3 m		
	Underlain by Precambrian gneiss		

COMPOSITE STRATIGRAPHIC SECTION C, CUMING INLET AREA

Formation	Loc. No.	Description	Field Interval
Bear Point	13	Mayr	25.0-112.5
Rabbit Point	13	Mayr	16.7-25.0
Strathcona Sound	13	Mayr	0.0-16.7
	16	Mayr	0.0-177.0

For correlation from locality 16 to locality 13 the top of the Strathcona Sound Formation was used; this surface is an unconformity with a considerable amount of relief. Units 14 to 26 may belong to the grey siltstone unit, although for description purposes they are included in the red siltstone unit.

Unit	Description	Thickness in metres: Unit	Total from base
	Overlying beds are dolomite of the Cass Fjord Formation		
	BEAR POINT FORMATION (CAMBRIAN) Upper member		
33	**Dolomite:** very slightly calcareous, medium grey-brown, medium crystalline; thick bedded with internal, regular, thin beds, labyrinthine mottling; weathers rusty-brown	6.1	272.8
	Middle member		
32	Covered interval: also part of lower member	71.0	266.7
31	**Shale:** green; bed of calcareous **siltstone** in lower part	2.1	195.7

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
30	**Dolomite:** calcareous, argillaceous, light green; very thin bedded, nodular; (?)trilobite fragments	0.4	193.6
29	**Siltstone:** dolomitic and calcareous, green, thin bedded, burrowed	1.4	193.2
28	**Shale:** green, some rusty coloured beds; poorly exposed unit	6.5	191.8
	Total thickness of Bear Point Formation: 87.5 m		
	RABBIT POINT FORMATION (CAMBRIAN)		
27	**Sandstone:** white, maroon in lower part, medium grained, very thick bedded; vague, very large (< 1 m) crossbeds; interbeds of maroon **shale conglomerate**; unit thins laterally and fills large channels in underlying unit	8.3	185.3
	STRATHCONA SOUND FORMATION (PROTEROZOIC) Red siltstone unit		
26	**Siltstone:** maroon, very thin bedded to thinly laminated, minor yellow bands	2.3	177.0
25	**Siltstone:** light green-grey, massive, some maroon-coloured patches	2.2	174.7
24	**Shale:** silty, green and maroon; upper and lower boundary gradational	1.1	172.5
23	**Sandstone:** very light green, fine grained, medium bedded; **subarkose**; in upper part, laminae of coarse grained **sandstone**	1.2	171.4
22	**Sandstone:** as in unit 20, shaly (GSC loc. C-77345, X-ray analysis)	0.3	170.2
21	**Sandstone:** as in unit 17	1.8	169.9
20	**Siltstone:** argillaceous, shaly, medium green, thinly laminated, recessive	0.3	168.1
19	**Sandstone:** as in unit 17	1.9	167.8
18	**Shale:** green; inaccessible	0.1	165.9
17	**Sandstone:** silty, very light green-yellow, very fine grained, thick bedded with internal lamination; **arkose**, mostly alkali feldspar, poorly sorted and rounded; discontinuous **shale** beds and pillows	3.6	165.8
16	**Sandstone:** light green, very fine grained, thin bedded, pillow structures; **subarkose**, subangular grains	0.2	162.2
15	**Sandstone:** light green, very fine grained, laminated; **arkose**	0.4	162.0
14	**Sandstone:** light green, very fine grained, thick bedded; **arkose**, rounded and well sorted grains; trace of **shale conglomerate**; units 14 to 26 have a reddish weathering colour when seen from a distance (GSC loc. C-77341, X-ray analysis)	1.3	161.6
13	Covered interval: thickness calculated; units 1 to 26 may be stratigraphically below unit 13	2.8	160.3
12	**Shale:** maroon; minor green interbeds; poorly exposed unit	33.2	157.5
11	**Siltstone:** argillaceous, green and maroon interbedded; thinly laminated; recessive	9.6	124.3
10	Covered interval	4.7	114.7

Unit	Description	Thickness in metres: Unit	Total from base
	Grey siltstone unit		
9	**Sandstone:** as below; very thin bedded; interbeds of green silty **shale**; fine grained **sandstone** bed on top	13.4	110.0
8	**Sandstone:** very slightly calcareous, medium grey brown, very fine grained, very thin bedded, large slump structures; **subarkose**, calcitized feldspars, fair sorting	0.6	96.6
7	**Sandstone:** very slightly calcareous, grey-green, very fine grained, thin to very thin bedded, shallow trough crossbeds, ripple marks; interbedded with **shale**, silty, light green and maroon, laminated to thinly laminated.	26.0	96.0
6	**Siltstone:** sandy, medium green, uniform thin and very thin bedding, rare ripple marks, shale flakes on bedding planes; single small *Rusophycus* type trace fossils; upper boundary gradational over at least 20 m	27.4	70.0
5	**Siltstone:** as below; poorly exposed interval	17.6	42.6
4	Covered interval	4.0	25.0
3	**Siltstone:** green, very thin bedded to uniformly laminated; arkosic **arenite**, predominantly alkali feldspar, clay cement; some maroon, argillaceous intervals (GSC loc. C-77332, X-ray analysis)	8.5	21.0
2	Covered interval	3.4	12.5
	Lower (carbonate) unit		
1	**Dolomite:** sandy, medium grey, very finely to aphanocrystalline, crenulated lamination, slumped, tepee(?) structures, 13-16 cm cycles, coarse grained dolomitic **sandstone** at base of cycle, overlain by laminated **dolomite** with fine grained sand; top of cycle is stromatolitic, aphanocrystalline **dolomite; conglomerate** at top of unit (GSC loc. C-77331; 1 and 5, thin sections, figs. 13-14)	9.1	9.1

Total thickness of Strathcona Sound Formation: 177.0 m

Section underlain by Precambrian gneiss

COMPOSITE STRATIGRAPHIC SECTION D, BURNETT INLET AREA

Formation	Loc. No.	Description	Field Interval
Cass Fjord	18	Narbonne	128.9-282.3
	17	Narbonne	23.3-122.5
Bear Point	18	Narbonne	4.5-29.7
Rabbit Point	18	Narbonne	0.0-4.5

Unit	Description	Thickness in metres	Total from base
	Overlying beds resistant, inaccessible carbonates of Cape Clay Formation		
	CASS FJORD FORMATION (CAMBRIAN-ORDOVICIAN)		
	Member D		
81	Covered interval	2.0	282.3
80	**Dolomite:** medium grey, thin bedded; **mudstone;** basal and uppermost bed flat-pebble **conglomerate** (0.2 x 2.0 cm pebbles) with sandy laminae; semi-resistant	2.0	280.3
79	**Dolomite:** medium grey, laminated to thinly laminated; predominantly **mudstone;** minor interbeds of sandy **dolomite** with small channels and minor interbeds of intraformational **conglomerate;** one bed with burrows; recessive	13.0	277.3
	Member C		
78	Covered interval: scree as below	21.0	265.3
77	**Sandstone:** interbedded with **dolomite** as in unit 74; semi-recessive	1.8	244.3
76	**Sandstone:** dolomitic, very light grey, coarse grained, thin bedded, desiccation polygons; **quartz arenite,** laminae of variable sorting; semi-recessive (GSC loc. C-77208, X-ray analysis)	1.0	242.5
75	**Dolomite:** medium grey; thin to very thin bedded; **mudstone;** semi-recessive	0.7	241.5
74	**Sandstone:** dolomitic; medium to dark grey, very fine grained, medium to thick bedded, low angle planar crossbeds; interbedded with minor **dolomite,** sandy, medium grey, aphanitic to very finely crystalline, medium bedded, semi-recessive; LLH stromatolites	2.0	240.8
73	Covered interval: scree of **sandstone,** sandy **dolomite,** oolitic **grainstone**	22.0	238.7
	Member B		
72	**Shale** and **dolomite:** as in unit 70	9.8	216.7
71	**Dolomite:** medium grey; single bed; intraformational **conglomerate** (0.2 x 5.0 cm maximum pebble size); small zones of stromatolites	0.9	206.9
70	**Shale:** as in unit 65; interbedded with **dolomite,** medium to dark grey, very finely to aphanocrystalline, thin to very thin bedded; minor interbeds and lenses of intraformational **conglomerate;** recessive	9.0	206.0
69	**Shale:** as in unit 65; rare interbeds of intraformational **conglomerate** and **dolomite** as in unit 70	12.0	197.0
68	**Stromatolitic bioherms:** bioherms 7-8 m high, 15-20 m wide, hemispherical; encased in **shale** as unit 65; solution pipes in bioherms	7.3	185.0
67	Covered interval: probably as unit 65	3.0	177.7
66	**Dolomite:** medium grey, very finely crystalline, thin bedded	1.2	174.7
65	**Shale:** dolomitic, silty, medium to dark grey, thinly laminated, very recessive	9.1	173.5

Unit	Description	Thickness in metres: Unit	Total from base
	Member A		
64	**Stromatolitic boundstone:** as in unit 62; columnar SH, 1.0 cm diameter, 7-8 cm high; semi-resistant	0.3	164.4
63	**Dolomite:** sandy, medium grey, medium crystalline, thin bedded, synaeresis and desiccation cracks, ripple crosslamination, herringbone cross-lamination; detrital dolarenite, non-carbonate grains mostly feldspar; semi-resistant	0.5	164.1
62	**Dolomite:** medium grey to medium purple-grey, thick bedded; stromatolitic **boundstone;** very closely spaced, small SH heads	1.0	163.6
61	**Dolomite:** slightly sandy, medium grey to purple-grey, thin bedded	1.5	162.6
60	**Dolomite:** as in unit 56; interbedded with flat-pebble **conglomerate**	3.4	161.1
59	**Dolomite:** as in unit 55	0.6	157.7
58	**Dolomite:** as in unit 56	1.2	157.1
57	**Dolomite:** as in unit 55	0.6	155.9
56	**Dolomite:** very sandy, light to medium grey, thin to medium bedded, ripple crosslamination; thin bed of intraformational **conglomerate** at base; semi-resistant	0.2	155.3
55	**Dolomite:** very silty, medium grey, very finely crystalline, very thin bedded, recessive	1.3	155.1
54	**Flat-pebble conglomerate:** as in unit 50	0.2	153.8
53	**Dolomite:** sandy, medium dark grey, very finely to finely crystalline; slightly wavy, medium bedding, flaser and lenticular bedding, ripple cross-lamination, symmetric ripples	2.4	153.6
52	Covered interval	2.5	151.2
51	**Dolomite:** medium to dark grey, finely crystalline, thin to medium bedded, very thin bedded in upper part; interbed of flat-pebble **conglomerate,** rare laminae of fine grained **sandstone**	1.6	148.7
50	**Dolomite:** sandy, medium grey; medium bedded; flat-pebble **conglomerate** with sandy matrix, clasts of finely crystalline, silty **dolomite,** 2-5 cm long	1.1	147.1
49	**Sandstone:** dolomitic, light purple-grey, fine grained, thin bedded	0.9	146.0
48	**Sandstone:** dolomitic, light purple-grey, fine grained, thin to very thin bedded, ripple marks, synaeresis cracks; black, silty laminae and very thin, argillaceous **siltstone** interbeds	1.1	145.1
47	Covered interval	9.0	144.0
46	**Sandstone:** dolomitic, light grey, fine to medium grained, thin to medium bedded, ripple crosslamination and low planar crossbedding; interbedded with **dolomite** as in unit 44	2.2	135.0
45	**Sandstone:** argillaceous, light grey, very fine to fine grained with lenses of medium grained, very thin bedded, ripple crosslamination, synaeresis cracks; **quartz arenite;** recessive	0.5	132.8

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
44	**Dolomite:** medium grey, finely crystalline, thin to medium bedded, synaeresis and desiccation cracks, sandy lenses with ripple crosslamination; interbedded with minor **sandstone,** light to medium grey, very fine grained, very thin bedded, ripple crosslamination and low angle planar crossbedding; rare intraformational **conglomerate**	3.0	132.3
43	**Dolomite:** dark grey; stromatolitic **boundstone**	0.4	129.3
42	Covered interval	1.4	128.9
41	**Dolomite:** medium grey, very finely crystalline, medium to thin bedded	2.1	127.5
40	**Dolomite:** as in unit 31; interbedded with flat-pebble **conglomerate** (0.3 x 7.0 cm maximum pebble size)	5.5	125.4
39	**Dolomite:** light green-grey; **dolosiltite;** thinly laminated; weathers purple	0.9	119.9
38	**Dolomite:** as in unit 31; desiccation cracks	3.2	119.0
37	**Dolomite:** medium grey, finely crystalline, thick bedded	1.2	115.8
36	Covered interval	3.1	114.6
35	**Dolomite:** medium to dark grey, finely crystalline, thin bedded	1.5	111.5
34	**Intraformational conglomerate:** as in unit 29	0.7	110.0
33	**Dolomite:** as in unit 31	2.3	109.3
32	**Dolomite:** very slightly calcareous, dark grey, coarsely crystalline; single bed	3.0	107.0
31	**Dolomite:** silty, light green-grey, laminated; **mudstone;** less silty in upper part	3.0	106.7
30	Covered interval: scree as in unit 31	10.5	103.7
29	**Dolomite:** light grey, very thin bedded, rare tool marks; **mudstone;** interbedded with intraformational **conglomerate** (0.4 x 3.0 cm maximum pebble size), medium bedded; rare *Planolites* sp. (GSC loc. C-77296, thin section, Fig. 25)	5.5	93.2
28	Covered interval: scree as in unit 24	10.5	87.7
27	**Intraformational conglomerate:** as in unit 22, minor interbeds of **dolomite**	3.0	77.2
26	**Dolomite:** light grey; thin, irregular bedding; fractured	0.7	74.2
25	**Intraformational conglomerate:** as in unit 22; interbedded with stromatolitic **boundstone,** planar mats and broadly spaced LLH	1.2	73.5
24	**Dolomite:** as in unit 22	0.3	72.3
23	Covered interval: scree as in unit 24	1.6	72.0
22	**Dolomite:** argillaceous, light green-grey, thin bedded, **mudstone;** interbedded with very finely crystalline "pure" **dolomite;** interbedded with intraformational **conglomerate** (0.3 x 10.0 cm maximum pebble size), thick bedded	2.2	70.4
21	Covered interval	1.7	68.2
20	**Dolomite:** as in unit 18	0.6	66.5
19	**Dolomite:** argillaceous, medium purple-grey, very finely crystalline, thinly laminated; at base sandy intraformational **conglomerate** (GSC loc. 77295, thin section, Fig. 24)	0.3	65.9

Unit	Description	Thickness in metres: Unit	Total from base
18	**Dolomite:** very light grey, very finely crystalline, thick bedded	2.0	65.6
17	**Dolomite:** light grey, very fine to finely crystalline, thinly laminated, abundant tepee structures	1.0	63.6
16	**Dolomite:** slightly calcareous, medium grey, medium bedded with internal thin lamination; stromatolitic **boundstone**, planar mats and variable small heads	7.0	62.6
15	**Dolomite:** very slightly silty, light to medium grey, finely crystalline, very thin bedded, recessive	7.8	55.6
14	**Dolomite:** light to medium grey, thin to medium bedded; single interbed of flat-pebble **conglomerate;** several slightly silty beds; resistant	1.9	47.8
13	**Dolomite:** as in unit 11; minor interbeds of flat-pebble **conglomerate;** recessive	3.4	45.9
12	**Dolomite:** medium grey, coarse to very coarse crystalline, thin to medium bedded, mottled texture on weathered surface; bed of silty **dolomite;** semi-recessive	1.3	42.5
11	**Dolomite:** medium grey, finely crystalline, thin to very thin bedded, authigenic feldspar, silty partings, minor interbeds of flat-pebble **conglomerate;** recessive	4.5	41.2
10	Covered interval	7.0	36.7

Total thickness of Cass Fjord Formation: 252.6 m

COMPOSITE STRATIGRAPHIC SECTION E, BURNETT INLET AREA

Formation	Loc. No.	Description	Field Interval
Allen Bay	20	Narbonne	117.5-130.0
Irene Bay	20	Narbonne	101.0-117.5
Thumb Mountain	20	Narbonne	0.0-101.0
Bay Fiord	19	Narbonne	67.1-280.5
Eleanor River	19	Narbonne	0.0-67.1

Unit	Description	Thickness in metres: Unit	Total from base
	ALLEN BAY FORMATION (ORDOVICIAN) Lower member		
	Overlying units not exposed		
110	**Limestone:** dolomitic, medium grey-brown, very thick bedded, labyrinthine mottling, rare stylolites; **lime mudstone** and minor skeletal **wackestone,** very resistant; rare solitary rugosans, abundant *Planolites* sp. burrows (GSC loc. C-77437, conodonts from base)	12.5	410.5

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	IRENE BAY FORMATION (ORDOVICIAN)		
109	**Limestone:** as in unit 107, recessive	3.0	398.0
108	**Limestone:** dolomitic, medium grey, medium bedded, wavy bedding planes, slightly nodular; skeletal **wackestone;** semi-recessive; diverse and abundant fossils, corals, brachiopods, trilobites, burrows (GSC loc. C-77433, macrofossils, C-77434, thin section, Fig. 52)	8.4	395.0
107	**Limestone:** dolomitic, medium grey, medium bedded, nodular; skeletal **wackestone;** recessive; corals, brachiopods, bryozoans rare (GSC loc. C-77432, conodonts)	2.1	386.6
106	Covered interval	3.0	384.5
	Total thickness of Irene Bay Formation: 16.5 m		
	THUMB MOUNTAIN FORMATION (ORDOVICIAN) Upper member		
105	**Limestone:** dolomitic, medium grey, thick bedded, nodular, lenticular internal bedding, minor labyrinthine mottling; rare *Halysites* sp. heliolitids, solitary rugosans, brachiopods, and crinoid fragments, *Planolites* sp. common (GSC loc. C-77431, conodonts)	21.3	381.5
104	**Limestone:** as in unit 103; thick to very thick bedded, resistant, rare crinoid fragments and solitary rugosans	13.5	360.2
103	**Limestone:** dolomitic, medium grey with pink dolomitic mottles, medium to thick bedded, labyrinthine mottling; skeletal **wackestone;** abundant *Planolites* sp. burrows	8.6	346.7
102	**Limestone:** dolomitic, medium grey, thick bedded, labyrinthine mottling; skeletal **wackestone;** resistant; abundant *Planolites* sp. burrows	4.5	338.1
101	**Limestone:** dolomitic, medium grey, thick bedded, irregularly nodular; skeletal **wackestone;** rare gastropods and orthocones	7.5	333.6
100	**Limestone:** as in unit 97; *Receptaculites* sp., *Favosites* sp., crinoid fragments (GSC loc. C-77428, conodonts)	13.8	326.1
99	**Limestone:** as in unit 97; rare *Receptaculites* sp. and *Maclurites* sp., burrows	3.0	312.3
98	**Limestone:** dolomitic, medium grey, thick to medium bedded, labyrinthine mottling; **lime mudstone;** rare **chert** nodules; top of unit formed by hardground; rare *Receptaculites* sp., corals	4.5	309.3
97	**Limestone:** dolomitic, medium grey, medium to thick bedded, vague labyrinthine mottling, gradational to nodular bedding; skeletal **wackestone;** *Receptaculites* sp. common, bryozoans, brachiopods, ostracodes, trilobites, stromatoporoids and crinoid fragments rare, trace fossils (*Planolites* sp.) common	3.0	304.8
96	**Limestone:** medium grey, thin to medium bedded; **lime mudstone** with bed of skeletal and intraclastic **wackestone** at base; (GSC loc. C-77423, conodonts)	1.4	301.8
95	**Limestone:** dolomitic, medium grey-brown, medium bedded, lenticular; *Planolites* sp.	0.6	300.4

Unit	Description	Thickness in metres	Total from base
	Lower member(?)		
94	**Dolomite:** calcareous, light grey, aphanocrystalline, very thin bedded, laminated; pelletal **grainstone**; weathers platy, recessive	0.3	299.8
93	**Limestone:** medium to dark grey, thick bedded; **lime mudstone**	1.1	299.5
92	**Limestone:** dolomitic, medium grey, medium bedded; labyrinthine mottling, gradational to irregular lumps; abundant *Planolites* sp.	7.3	298.4
91	**Limestone:** dolomitic, medium grey with grey-buff mottles, medium to thick bedded, lenticular, labyrinthine mottling; skeletal **wackestone**; rare brachiopods, abundant *Planolites* sp.	2.5	291.1
90	**Dolomite:** as in unit 88; single bed of **limestone** as in unit 89	2.2	288.6
89	**Limestone:** dolomitic, medium grey-brown, thick bedded, mottled; **lime mudstone** and **wackestone**; *Chondrites* sp. (GSC loc. C-77420, conodonts)	1.0	286.4
88	**Dolomite:** slightly calcareous, very light grey, medium bedded, minor burrow mottling; **lime mudstone**	2.0	285.4
87	**Dolomite:** highly calcareous, medium grey-brown, thick bedded, labyrinthine mottling; **lime mudstone** with minor **wackestone**; resistant; *Planolites* sp. burrows common	2.9	283.4
	Total thickness of Thumb Mountain Formation: 101.0 m		
	BAY FIORD FORMATION (ORDOVICIAN) Member D		
86	Covered interval	2.4	280.5
85	**Dolomite:** slightly calcareous, medium grey, very thin to thin bedded; **mudstone** and skeletal **wackestone**; semi-recessive	3.6	278.1
84	**Dolomite:** calcareous, dark grey, thin to thick bedded, stylolites; **mudstone**; resistant	2.6	274.5
83	**Dolomite:** medium grey, very thin bedded, semi-recessive	0.6	271.9
82	**Shale:** medium grey-green, non-laminated, friable	0.3	271.3
81	**Dolomite:** highly calcareous, medium grey; single bed; **mudstone**	0.6	271.0
80	**Dolomite:** highly calcareous, medium grey, aphanocrystalline; predominantly thin bedded, minor medium bedded; **mudstone**, one bed of skeletal **packstone**; base of unit irregular with hematite coating. (?)hardground (GSC loc. C-77418, conodonts)	1.3	270.4
79	**Dolomite:** slightly calcareous, medium grey, thin to medium bedded; **mudstone**; recessive	0.8	269.1
78	Covered interval	4.2	268.3
77	**Dolomite:** slightly calcareous, thin to medium bedded; **mudstone**; semi-resistant	3.1	264.1
76	Covered interval	3.0	261.0
75	**Dolomite:** similar to unit 73, no vugs; rare *Planolites* sp. burrows	3.0	258.0
74	Covered interval: scree as unit 73	11.8	255.0

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
73	**Dolomite:** medium grey-brown, medium bedded; **mudstone,** silt-sized grains, vuggy; rare *Planolites* sp. burrows	2.0	243.2
72	Covered interval	2.0	241.2
	Member C		
71	**Dolomite:** medium grey, medium bedded; **mudstone;** semi-resistant; *Chondrites* sp. and *Planolites* sp. burrows common	1.5	239.2
70	**Dolomite:** as in unit 50; recessive	1.5	237.7
69	**Dolomite:** medium grey with grey-buff mottles, medium bedded, labyrinthine mottling; skeletal **wackestone;** resistant; abundant fossil debris, bryozoans, brachiopods, corals, trace fossils		
68	**Dolomite:** argillaceous, dark grey, thinly laminated; **mudstone;** recessive	0.7	228.2
67	**Dolomite:** medium grey, medium bedded; **dolosiltite,** lenses of intraclast and skeletal **packstone;** semi-resistant, weathers with orange tinge	0.6	227.5
	Member B		
66	**Dolomite:** as in unit 50; recessive	1.7	226.9
65	Covered interval	18.5	225.2
64	**Dolomite:** as in unit 50; recessive	3.0	206.7
63	**Dolomite:** as in unit 51; one bed of skeletal **packstone;** semi-resistant (GSC loc. C-77415, conodonts)	0.9	203.7
62	**Dolomite:** as in unit 50; recessive	1.7	202.8
61	**Dolomite:** as in unit 51; synaeresis cracks and halite casts	0.7	201.1
60	**Dolomite:** as in unit 50	2.3	200.4
59	**Dolomite:** as in unit 51; single bed of intraclast **floatstone**	0.5	198.1
58	**Dolomite:** as in unit 50; some thin beds	4.3	197.6
57	**Dolomite:** slightly calcareous, medium grey; finely crystallized, fine grained **grainstone;** medium bedded; weathers orange-buff (GSC loc. C-77412, conodonts)	0.6	193.3
56	**Dolomite:** as in unit 50	3.0	192.7
55	**Dolomite:** as in unit 51	1.0	189.7
54	Covered interval: probably **dolomite** as in unit 52	5.9	188.7
53	**Dolomite:** as in unit 51	1.3	182.8
52	**Dolomite:** as in unit 50	1.6	181.5
51	**Dolomite:** medium grey, thin to medium bedded; **mudstone;** very rare intraclasts on bedding surfaces; weathers orange-grey, semi-recessive	0.5	179.9
50	**Dolomite:** medium grey, very thin bedded, weathers medium grey, very friable, very recessive; **mudstone;** unit at break in slope with steeper incline above (GSC loc. C-77411, X-ray analysis)	1.4	179.4

Unit	Description	Thickness in metres	Total from base
49	**Dolomite:** as in unit 41, selenite	1.1	178.0
48	**Dolomite:** as in unit 40, rare selenite lenses	0.9	176.9
47	**Dolomite:** as in unit 41, selenite	5.0	17[illegible].0
46	**Dolomite:** as in unit 44, rare laminae of selenite	3.0	171.0
45	**Dolomite:** as in unit 41, selenite	1.2	168.0
44	**Dolomite:** medium grey-buff, thinly laminated, very recessive	6.1	166.8
43	**Dolomite:** medium grey; thin bedded with internal lamination; **mudstone;** abundant gypsiferous laminae; recessive	2.2	160.7
42	**Dolomite:** as in unit 40	3.6	158.5
41	**Dolomite:** medium grey, laminated to very thin bedded; **mudstone;** very thin beds of **selenite;** recessive	0.9	154.9
40	**Dolomite:** medium grey, finely crystalline; recrystallized, silt-sized **grainstone;** thin to very thin bedded; semi-recessive	1.4	154.0
	Member A		
39	**Gypsum:** interbedded with **shale** as in unit 22; minor laminae and interbeds of thinly laminated **dolomite;** recessive	25.3	152.6
38	**Gypsum:** interlaminated with **dolomite** as in unit 31; semi-resistant	0.9	127.3
37	Covered interval	10.5	126.4
36	**Gypsum:** as in unit 24; interbedded with gypsiferous **dolomite** as in unit 35 (GSC loc. C-77410, X-ray analysis)	3.0	115.9
35	**Dolomite:** medium grey, thin bedded; with minor **gypsum** laminae; interbedded with laminated, gypsiferous, locally argillaceous **dolomite**	5.5	112.9
34	**Gypsum:** as in unit 24	1.0	107.4
33	**Gypsum:** as in unit 31; interbedded with sandy **dolomite** as in unit 28, interbedding on metre scale	11.4	106.4
32	Covered interval	3.0	95.0
31	**Gypsum:** white; interlaminated with **dolomite,** medium grey, thin bedded; semi-resistant	0.4	92.0
30	**Gypsum:** as in unit 24	6.2	91.6
29	**Gypsum:** as in unit 24; lens of black **shale**	1.0	85.4
28	**Dolomite:** sandy, gypsiferous medium buff-brown, medium crystalline, laminated, argillaceous at base	1.2	84.4
27	**Gypsum:** as in unit 24; lenses of black **shale**	1.1	83.2
26	**Gypsum:** as in unit 24	3.0	82.1
25	**Shale:** as in unit 22	0.4	79.1
24	**Gypsum:** dolomitic, white, medium to thick bedded, "chicken wire"; small nodules of black **chert** common	2.3	78.7

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
23	**Dolomite:** as in unit 21	0.8	76.4
22	**Shale:** dolomitic, black, thinly laminated; thin interbeds of **dolomite**, dark grey, laminated	0.6	75.6
21	**Dolomite:** very gypsiferous, medium to dark grey, very finely to aphanocrystalline, thin bedded; small nodules of **gypsum** abundant	1.6	75.0
20	**Gypsum:** as in unit 16; thin lenses of black, friable **shale**	2.4	73.4
19	**Dolomite:** as in unit 17	0.2	71.0
18	**Gypsum:** as in unit 16	0.4	70.8
17	**Dolomite:** medium grey, very thin bedded, small-scale bird's-eye texture, laminated; pelletoidal(?) **grainstone;** thickness varies strongly laterally	0.1	70.4
16	**Gypsum:** white, coarse grained; single bed; gradational basal contact	0.3	70.3
15	**Gypsum:** medium grey, thinly laminated; argillaceous lamination and several thin interbeds of **gypsum** as in unit 16	2.9	70.0
	Total thickness of Bay Fiord Formation: 213.4 m		
	ELEANOR RIVER FORMATION (ORDOVICIAN) Member D		
14	**Dolomite:** medium grey, medium bedded, rare ripple marks; detrital **dolosiltite;** interbedded with medium grey, laminated **dolomite** and minor patterned carbonate; semi-recessive	4.5	67.1
13	**Dolomite:** slightly calcareous, medium grey, very finely crystalline, predominantly medium bedded; minor, thin bedded, abundant patterned carbonate; semi-recessive; uppermost bed intensely burrowed (*Planolites* sp. abundant, *Chondrites* sp. common)	1.6	62.6
12	Covered interval	6.0	61.0
11	**Dolomite:** slightly calcareous, medium brown, very thin bedded, internal lamination; coarse **dolosiltite,** rare interbeds of vuggy **dolomite** as in unit 6; recessive	2.5	55.0
10	**Dolomite:** as in unit 6; vuggy	3.0	52.5
9	**Dolomite:** as in unit 8; thin bedded, no chert	3.1	49.5
8	**Dolomite:** slightly calcareous, medium grey-buff, very finely to finely crystalline, medium to thick bedded, nodular, abundant stylolites; abundant nodules of dolomitic, white **chert;** resistant	6.0	46.4
7	**Dolomite:** slightly calcareous, medium grey-buff, very finely to finely crystalline, thick bedded, labyrinthine mottling, abundant stylolites, vuggy, semi-resistant; some beds with abundant *Planolites* sp. and *Chondrites* sp.	6.0	40.4
6	**Dolomite:** slightly calcareous, light to medium grey, thin bedded, patterned carbonate; **dolosiltite;** recessive; rare *Chondrites* sp.	6.1	34.4
5	**Limestone:** as below in unit 4; abundant **chert** nodules	4.7	28.3
4	**Limestone:** dolomitic, medium grey, thick bedded, labyrinthine mottling; **lime mudstone;** resistant	6.6	23.6
3	**Limestone:** dolomitic, medium grey, thick bedded, labyrinthine mottling; **lime mudstone;** resistant; *Planolites* sp.	3.4	17.0

Unit	Description	Thickness in metres	Total from base
2	**Limestone:** medium grey, thick to very thick bedded, abundant stylolites; **lime mudstone;** very small nodules of white **chert**	7.2	13.6
1	**Limestone:** medium grey, thin to medium bedded, abundant stylolites, some beds with labyrinthine mottles, recessive	6.4	6.4
	Underlying beds of member C not exposed		
	Measured thickness of Eleanor River Formation: 67.1 m		

STRATIGRAPHIC SECTION F, BLANLEY BAY AREA

Formation	Loc. No.	Description	Field Interval
Blanley Bay	21	Thorsteinsson Garagan	18.6-144.0 (type section)
Cape Clay	21	Garagan	0.0-18.6

Unit	Description	Thickness in metres	Total from base
	BLANLEY BAY FORMATION (ORDOVICIAN) Upper member		
31	**Dolomite:** very slightly silty, light to medium grey, predominantly thin bedded; **dolosiltite;** minor pelletoidal **grainstone;** authigenic feldspar; rare interbeds of flat-pebble **conglomerate** and pale green dolomitic **shale;** chert nodules in lower part; uppermost bedding plane hardground; semi-recessive	9.4	144.0
30	Covered interval	1.5	134.6
29	**Limestone:** light yellow-grey, thin bedded; interbedded with calcareous **dolomite** and flat-pebble **conglomerate;** semi-recessive	2.1	133.1
28	**Dolomite:** calcareous, light brown, thick bedded; **dolosiltite;** laminated with **sandstone** in lower part	4.0	131.0
27	**Dolomite:** sandy, medium grey-brown, medium crystalline, medium to thick bedded; floating, coarse, well rounded sand grains and dolomite intraclasts; rare calcite-filled vugs; resistant	3.3	127.0
26	**Sandstone:** medium grey-brown, fine to medium grained, medium bedded, semi-resistant	3.3	123.7
25	**Dolomite:** calcareous, light brown, finely crystalline, thick bedded, vuggy, resistant	2.7	120.4
24	**Sandstone:** as above in unit 26	11.8	117.7
23	**Dolomite:** shaly, light grey, very finely crystalline, thin bedded; **chert** nodules	3.6	105.9
22	**Dolomite:** calcareous, light brown, finely crystalline to aphanocrystalline, thick bedded	4.9	102.3
21	**Dolomite:** light brown, finely crystalline, laminated; stromatolitic **boundstone**	1.0	97.4

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
20	**Breccia:** as in unit 17; minor gypsum	9.6	96.4
19	**Dolomite:** as in unit 16; **sandstone** bed at top of unit	2.1	86.8
18	**Breccia:** massive: evaporite solution breccia; fragments up to 5 x 5 cm in size, **dolomite** as unit 16 and oolitic **grainstone**	2.5	84.7
17	**Dolomite:** calcareous, light grey, very finely crystalline, medium bedded, vuggy; **chert** nodules	2.0	82.2
16	**Breccia:** sandy, white, very thick bedded; **limestone** fragments	3.0	80.2
15	**Sandstone:** as in unit 4; interbedded with sandy **dolomite** in upper part	3.4	77.2
14	**Dolomite:** slightly calcareous, medium grey, finely crystalline, medium bedded, burrowed, pelletal, vuggy in upper part	2.0	73.8
13	**Sandstone:** calcareous, white, medium grained, medium bedded; mature **quartz arenite**	1.9	71.8
12	**Dolomite:** calcareous, light yellow-brown, very finely crystalline, medium bedded; abundant nodules of white **chert**; semi-recessive	1.0	69.9
11	**Sandstone:** calcareous, white, fine to medium grained, medium to thick bedded; mature **quartz arenite**; minor interbeds of **dolomite** in lower part; weathers vuggy, semi-recessive	7.8	68.9
	Lower member		
10	**Dolomite:** very light brown, very finely crystalline, thick bedded, mottled, resistant	5.6	61.1
9	**Dolomite:** sandy, medium brown, finely crystalline, thick bedded; bed of flat-pebble **conglomerate** at base, grading to dolomitic **sandstone** in upper part	8.5	55.5
8	**Dolomite:** medium grey, finely crystalline, medium bedded; hardground at top of unit; abundant nodules of black **chert**	0.5	47.0
7	**Dolomite:** light grey, very finely crystalline, uniformly very thin to thin bedded	0.6	46.5
6	**Flat-pebble conglomerate:** medium grey, medium bedded	0.5	45.9
5	**Dolomite:** medium grey, finely crystalline, medium bedded, vuggy in upper part	0.7	45.4
4	**Dolomite:** medium grey, finely to medium crystalline, thin to medium bedded; interbeds of flat-pebble **conglomerate**; rare **gypsum** nodules (GSC loc. C-80134, conodonts)	14.0	44.7
3	**Sandstone:** dolomitic, light brown, fine grained, medium bedded	1.0	30.7
2	**Dolomite:** medium grey, very finely crystalline, predominantly thin bedded; sandy and silty in upper part; **chert** nodules; resistant	11.1	29.7
	Total thickness of Blanley Bay Formation: 125.4 m		
	CAPE CLAY FORMATION		
1	**Limestone:** dolomitic, medium grey, thick to very thick bedded, labyrinthine mottling; **lime mudstone**; resistant (GSC loc. C-80132, conodonts)	18.6	18.6

COMPOSITE STRATIGRAPHIC SECTION G, RIGBY BAY AREA

Formation	Loc. No.	Description	Field Interval
Allen Bay			
Upper member	38	Mayr	0.0-218.0
Middle member	37	Mayr	13.5-56.0
	36	Mayr	10.5-174.0
	35	Mayr	0.0-10.0
Lower member	34	Mayr	0.0-144.3

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	CAPE STORM FORMATION (SILURIAN)		
	Covered interval; recessive, platy weathering siltstone and carbonates; not examined		
	ALLEN BAY FORMATION (SILURIAN) Upper member		
93	**Dolomite:** slightly calcareous, medium brown, medium bedded; breccia zones; resistant	2.7	666.3
92	**Dolomite:** light brown, finely crystalline, thin to medium bedded, internal wavy lamination(?); detrital **dolosiltite**	4.5	663.5
91	**Dolomite:** slightly calcareous, dark brown, very thick bedded; vague, large, **shale** crossbeds	2.8	659.2
90	**Dolomite:** slightly calcareous, light grey-brown, medium crystalline, laminated; lenses of breccia	2.3	656.3
89	**Dolomite:** calcareous, medium brown, medium crystalline, thick bedded; interbedded with laminated, stromatolitic **dolomite**	10.2	654.0
88	**Dolomite:** medium brown, finely crystalline; interbedded with **lime mudstone**, argillaceous, dark grey, laminated to finely laminated; minor interbeds of stromatolitic **limestone**	5.4	643.8
87	**Dolomite:** medium brown, medium crystalline, medium bedded, minor thin bedded; zones with small LLH stromatolites	13.3	638.4
86	Covered interval: probably medium bedded **dolomite**	4.5	625.1
85	**Dolomite:** medium brown, medium crystalline, thin bedded, light brown mottles	1.5	620.6
84	**Dolomite:** medium brown, finely crystalline, thin to very thin bedded, regular and planar internal lamination, purple coloured bedding planes	6.0	619.1
83	**Dolomite:** dark brown, medium crystalline, medium bedded, minor internal lamination; tabular stromatoporoids common	6.8	613.1
82	Covered interval: possibly platy weathering **dolomite**	27.0	606.3
81	**Dolomite:** dark brown, medium crystalline, thick bedded, crossbedding; skeletal **grainstone**; stromatoporoids and cephalopods common; unit poorly exposed	12.0	579.3

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
80	Covered interval	13.5	567.3
79	**Dolomite:** calcareous, light brown, medium crystalline, thin bedded, vague stromatolitic lamination; grading upward into thick bedded dolomite; abundant **chert** nodules	3.5	553.8
78	**Breccia:** small **dolomite** clasts; massive; stromatolites in upper part	3.0	550.3
77	**Breccia:** as in unit 69; solitary corals	8.5	547.3
76	**Dolomite:** calcareous, light brown, finely to medium crystalline, very thin bedded to laminated; detrital **dolosiltite**	2.6	538.8
75	**Limestone:** dark brown, medium bedded, abundant stromatolites	2.2	536.2
74	**Limestone:** medium brown, thin bedded; **grainstone, calcirudite,** composite grains and coated grains (GSC loc. C-77151, thin section, Fig. 57)	1.0	534.0
73	**Limestone:** dolomitic, dark brown, very thick bedded, labyrinthine mottling; **lime mudstone** and skeletal **wackestone**	3.0	533.0
72	**Limestone:** medium brown, medium bedded; **lime mudstone;** very abundant small LLH stromatolites	8.4	530.0
71	**Limestone:** very dolomitic, very thin bedded; unit poorly exposed	5.6	521.6
70	**Limestone:** dark brown, thin bedded, very thin bedded in upper part, mottled, burrows; **lime mudstone**	2.2	516.0
69	**Breccia:** massive; heterogeneous carbonate fragments, chaotic structure; discontinous zones of algal lamination and stromatolites; solution collapse breccia	18.3	513.8
68	Covered interval: probably **dolomite,** medium brown, medium crystalline, very thin bedded to laminated	1.2	495.5
67	**Limestone:** medium brown, thin to medium bedded; **lime mudstone** (GSC loc. C-77120, conodonts)	6.0	494.3
66	Covered interval	7.0	488.3
65	**Dolomite:** medium brown, finely crystalline, very thin bedded	3.8	481.3
64	**Limestone:** dolomitic, dark brown, medium bedded; pelletoidal **grainstone;** interbedded with **dolomite,** calcareous, dark brown, thin bedded to laminated	4.0	477.5
63	**Stromatolitic boundstone:** erosional lower boundary with **conglomerate;** upper part of unit 1 m thick LLH stromatolites	3.7	473.5
62	**Dolomite:** slightly calcareous, light brown, finely crystalline, laminated, light brown laminae	2.8	469.8
61	**Dolomite:** very slightly calcareous, light grey, finely crystalline; bed of LLH stromatolites	1.0	467.0
60	**Dolomite:** slightly calcareous, medium brown, medium crystalline, laminated; patterned carbonate in upper part; very sharp upper boundary	1.5	466.0
59	**Dolomite:** calcareous, light brown, finely crystalline, very thin bedded	0.3	464.5
58	**Limestone:** medium brown, laminated; cryptalgal **lime mudstone**	0.7	464.2
57	**Dolomite:** slightly calcareous, dark brown, finely crystalline, laminated; detrital **dolosiltite,** pelletoidal **grainstone**	2.0	463.5

Unit	Description	Thickness in metres: Unit	Total from base
56	**Dolomite:** shaly, light green-grey, finely crystalline, thinly laminated; nodules and discontinuous beds of **chert**; thick bed of intraformational **conglomerate** at top	2.2	461.5
55	**Dolomite:** calcareous, light grey-brown, finely crystalline, thin bedded; detrital **dolosiltite**; abundant large spherical stromatolites; units 46 to 55 form doublets, **grainstone** with sharp lower boundary grades upward into laminated **dolomite**	2.0	459.3
54	**Limestone:** dolomitic, dark brown, massive; pelletoidal **grain-** and **pack-stone**, abundant skeletal clasts	1.1	457.3
53	**Dolomite:** calcareous, medium brown, finely crystalline, thin bedded to laminated; **dolosiltite** with micrite laminae; stromatolites	1.0	456.2
52	**Limestone:** dark brown, thick bedded; coated-grain **grainstone**	1.1	455.2
51	**Dolomite:** as in unit 49	2.0	454.1
50	**Limestone:** brown; oolitic **grainstone**; single bed	0.3	452.1
49	**Dolomite:** calcareous, light grey-brown, finely crystalline, laminated; detrital **dolosiltite** with micrite pellets	1.1	451.8
48	**Limestone:** medium brown, medium bedded; oolitic **grainstone**	0.3	450.7
47	**Dolomite:** as in unit 45	0.6	450.4
46	**Limestone:** medium brown, thin bedded to laminated; oolitic **grainstone** with laminae of detrital **dolosiltite**	0.5	449.8
45	**Dolomite:** light grey-brown, finely crystalline, thick bedded with internal lamination, possibly crosslaminated; detrital **dolosiltite**	1.0	449.3
44	Covered interval: below sea level; thickness estimated	2.5	448.3
	The contact between the lower and middle members is marked by a prominent change in weathering colour; dark brown below, light and medium brown striping above		
	Middle member (Silurian)		
43	**Dolomite:** dark brown, medium crystalline, very thick bedded; abundant fractures with dolospar; resistant; small spherical stromatoporoids, crinoid fragments, (?)orthocones	2.0	445.8
42	Covered interval: platy weathering, medium to light brown **dolomite**	9.0	443.8
41	**Breccia:** massive; boulders of **dolomite** as in unit 37, solution collapse breccia	7.2	434.8
40	Covered interval	10.2	427.6
39	**Dolomite:** as in unit 37; rubbly weathering, abundant skeletal fragments	2.1	417.7
38	**Dolomite:** medium brown, thin bedded with internal lamination; trace of **grainstone** texture; rare intraformational **breccia**; several beds with abundant gastropods	1.8	415.3
37	**Dolomite:** dark brown, medium crystalline, very thick bedded, labyrinthine mottling; abundant small fractures with dolospar; good intercrystalline porosity; abundant small spherical stromatolites, rare, tabular stromatoporoids and solitary corals	10.2	413.5
36	Covered interval: barometer measured	85.0	403.3

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
35	**Dolomite:** dark brown, coarsely crystalline, massive, zones of labyrinthine mottles, resistant; large tabular and spherical stromatoporoids common	7.8	318.3
34	**Dolomite:** dark brown, medium to coarsely crystalline, massive, coarsely crystalline mottles; (?)intraclastic or skeletal **grainstone,** intercrystalline porosity; resistant; small spherical stromatoporoids, *Favosites* sp. and tabular stromatoporoids common	6.6	310.5
33	**Dolomite:** dark brown, coarsely crystalline, massive, (?)bioturbation; (?)skeletal **grainstone;** resistant, cliff-forming; stromatoporoids and small cephalopods abundant, tabular *Favosites* sp. common, brachiopods rare	2.6	303.9
32	**Dolomite:** medium brown, medium crystalline, medium to thin bedded, intervals of lamination, in upper part cryptalgal lamination; recessive, weathers white to grey; unit poorly exposed	19.1	301.3
31	**Dolomite:** slightly calcareous, medium brown, medium crystalline, massive, light brown labyrinthine mottles; interbeds of **dolomite** as below in unit 30; small *Favosites* sp. common, particularly in lower part	7.4	282.2
30	**Dolomite:** slightly calcareous, light grey brown, medium crystalline; discontinuous unit	0.6	274.8
29	**Dolomite:** medium brown, medium crystalline, massive; biostromal unit consisting of 30% tabular stromatoporoids and large hemispherical *Halysites* sp.	4.5	274.2
28	**Biohermal unit, dolomite:** small bioherms of *Halysites* sp., *Favosites* sp. and stromatoporoids; matrix of coarse and very coarse skeletal **grainstone**	1.7	269.7
27	**Dolomite:** calcareous, medium brown, medium crystalline, massive; dark brown, labyrinthine mottling; skeletal **floatstone;** resistant; tabular stromatoporoids and colonial corals common, spherical stromatoporoids rare	15.4	268.0
26	**Dolomite:** covered or poorly exposed interval; slightly calcareous, light grey, finely to medium crystalline, thin bedded with interval lamination; abundant, small LLH stromatolites in uppermost part; upper contact gradational; units 21 to 26 form a prominent, light weathering, recessive interval	21.5	252.6
25	**Limestone:** dark brown-grey, thin bedded; **lime mudstone;** interbedded with **dolomite,** slightly calcareous, finely crystalline, light grey; some flat-pebble **conglomerate;** unit poorly exposed	7.3	231.1
24	**Dolomite:** slightly calcareous, light brown, finely crystalline, medium bedded, internal planar and wavy lamination, fine nodular intervals, traces of patterned **carbonate;** unit poorly exposed	5.3	223.8
23	**Limestone:** dark grey, thin bedded with dolomitic lamination, horizontal mottles, small tracks on bedding planes; small H stromatolites	5.2	218.5
22	Covered interval	4.0	213.3
21	**Limestone:** medium grey with white lamination; laminated; **lime mudstone;** laminae of penecontemporaneous **dolomite,** laminae fractured and offset, lamination probably cryptagal; prominent break in slope between units 20 and 21 (GSC loc. C-77104, thin section, Fig. 54)	0.5	209.3
20	**Dolomite:** calcareous, dark brown, medium crystalline, thick bedded; in upper part mottled **limestone,** intraclast **grainstone,** dolomitic; very abundant brachiopods, locally coquina	9.0	208.8
19	**Limestone:** dolomitic, fetid, very dark brown; medium brown labyrinthine mottles; **lime mudstone;** spherical stromatoporoids and colonial corals common; unit poorly exposed	15.0	199.8

Unit	Description	Thickness in metres: Unit	Total from base
18	Covered interval	7.3	184.8
17	**Dolomite:** calcareous, medium brown, medium crystalline, thin bedded, mottled; skeletal **wackestone;** brachiopods common	1.0	177.5
16	Covered interval	4.2	176.5
15	**Dolomite:** calcareous, light brown, coarsely crystalline, massive; tabular stromatoporoids abundant, colonial corals common, fossils poorly preserved	12.2	172.3
14	**Dolomite:** calcareous, medium to light brown, medium crystalline, thin bedded, minor wavy lamination; poorly preserved spherical stromatoporoids; rare, small, crinoid fragments; upper boundary very gradational	5.3	160.1
13	Covered interval	0.5	154.8
12	**Limestone:** as below in unit 11; massive, internal thin bedding, nodular; **dolomite** partings; spherical stromatoporoids common	3.5	154.3
11	**Limestone:** dolomitic, medium brown, very thick bedded, labyrinthine mottling; tabular corals and stromatoporoids common	4.5	150.8
10	**Dolomite:** argillaceous, slightly silty, very dark grey, very finely crystalline, thin bedded; (?)detrital **dolosiltite;** abundant ostracodes and trace fossils, rare trilobite fragments; upper and lower boundaries sharp, lower boundary hardground (GSC loc. C-79481, conodonts)	2.0	146.3
	Lower member (Ordovician)		
9	**Limestone:** light brown-grey, thin to medium bedded; pelletoidal **grainstone;** semi-resistant	1.5	144.3
8	**Limestone:** dolomitic and slightly argillaceous, very dark grey, thin to medium bedded; thin interbeds of **dolomite,** calcareous, medium brown; large nodules of white **chert;** recessive; rare corals and gastropods in upper part; abundant dendroid (?)stromatoporoids	6.3	142.8
7	Covered interval	1.5	136.5
6	**Limestone:** dolomitic, very dark brown, medium to thick bedded, labyrinthine mottles, banded with **dolomite; lime mudstone;** pockets and laminae of skeletal **wackestone;** abundant white **chert** nodules; minor brecciation; resistant (GSC loc. C-77247, conodonts)	7.0	135.0
5	**Limestone:** dolomitic, medium brown, thick bedded, labyrinthine mottling; **lime mudstone** with zones of skeletal **wackestone;** resistant; fossils generally rare, *Maclurites* sp., *Catenipora* sp. stromatoporoids, solitary corals and cephalopods, dasycladaceans; about 60 m above base zone of abundant tabular stromatoporoids and corals	104.7	128.0
4	**Limestone:** as in unit 2; medium grey, massive, nodular, dolomite partings, resistant; rare corals and stromatoporoids	16.5	23.3
3	**Limestone:** argillaceous, medium brown-grey; skeletal **packstone;** weathers rubbly, grey-green, recessive; corals and crinoids common, gastropods rare	0.6	6.8
2	**Limestone:** slightly dolomitic, medium brown, massive, rare labyrinthine mottling; skeletal **wackestone** to intraclast **packstone;** calcispheres, sponge spicules, dasycladaceans, fragments of corals; ostracodes and crinoids (GSC loc. C-77242, conodonts; C-77243, thin section, Fig. 53)	6.2	6.2

Total thickness of Allen Bay Formation: 666.3 m

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	IRENE BAY FORMATION (ORDOVICIAN)		
1	Covered interval: scree slope; unit not examined		

COMPOSITE STRATIGRAPHIC SECTION H, SOUTH RADSTOCK BAY AREA

Formation	Loc. No.	Description	Field Interval
Barlow Inlet	41	Narbonne	56.1-139.8
Douro	41	Narbonne	0.0-56.1
	40	Narbonne	0.0-82.4
Cape Storm	39	Narbonne	0.0-76.8

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	BARLOW INLET FORMATION (SILURIAN) Upper member		
	Overlying units not exposed		
59	**Crinoidal grainstone:** as in unit 54; felsenmeer	20.0	299.0
58	**Limestone:** as in unit 56	2.4	279.0
57	**Limestone:** light to medium grey; single bed; crinoidal **packstone;** semi-resistant	0.5	276.6
56	**Limestone:** dolomitic, medium grey, medium bedded, wavy bedding; crinoidal and skeletal **wackestone;** semi-resistant; stromatoporoids common, corals rare	2.6	276.1
55	**Limestone:** dolomitic, medium grey, medium bedded, irregular bedding planes; skeletal and crinoidal **wackestone;** rock averages 20% silicified fossils in life position, phaceloid rugosans abundant, stromatoporoids common, *Favosites* sp. rare (GSC loc. C-77485, conodonts)	3.3	273.5
54	**Limestone:** very light grey, thick bedded; crinoidal **grainstone;** unit contains 20 x 5 m bioherm	11.3	270.2
53	**Limestone:** dolomitic, medium to dark grey, thick bedded, nodular; **wackestone;** rare stromatoporoids and colonial corals (GSC loc. C-77483, conodonts)	6.0	258.9
52	**Limestone:** medium grey, massive; biostromal **wackestone, floatstone** with skeletal **packstone** matrix; unit consists of 70% phaceloid rugosans and bryozoans, *Heliolites* sp., *Syringopora* sp., *Favosites* sp. and stromatoporoids rare	0.9	252.9
51	**Limestone:** dolomitic, medium to dark grey, very thick bedded, nodular; **lime mudstone;** semi-resistant; orthocones common, corals rare, bioherms observed in distance within unit 51	11.3	252.0

Unit	Description	Thickness in metres: Unit	Total from base
50	**Limestone:** very slightly dolomitic, very light grey, very thick bedded; crinoidal **grainstone**, rare **packstone**; resistant; abundant corals and stromatoporoids in lower part; units 50 to 59 form flank of large reef	10.6	240.7
49	**Limestone:** dolomitic, medium grey, thick bedded, nodular; crinoidal **wackestone**; semi-recessive; corals, trilobites and brachiopods rare (GSC loc. C-77480, conodonts)	4.3	230.1
48	**Limestone:** medium grey, medium bedded, labyrinthine mottling; crinoidal **wacke-** and **pack-stone**; semi-resistant; corals and brachiopods rare; unit laterally equivalent to small bioherm	1.5	225.8
47	**Limestone:** argillaceous and dolomitic, medium grey, very thick bedded, nodular; **lime mudstone**; interbedded with dolomitic skeletal **wackestone**; trace fossils as in unit 46 below	9.0	224.3
	Exposed thickness of Barlow Inlet Formation: 83.7 m		
	DOURO FORMATION (SILURIAN)		
46	**Limestone:** argillaceous and dolomitic, medium grey, medium bedded, wavy bedding; **lime mudstone** with minor intraclastic and shelly **floatstone**; recessive; *Chondrites* sp. common, *Planolites* sp. and *Palaeophycus* sp. rare	15.0	215.3
45	**Limestone:** dolomitic, medium grey to medium grey-buff, medium to thick bedded, nodular, megaripples; **lime mudstone** with minor crinoidal **wackestone**; rare brachiopods, *Scolithus* sp. and *Planolites* sp. common	3.6	200.3
44	**Limestone:** argillaceous, medium grey, medium bedded, nodular; **lime mudstone** with minor shelly **floatstone**; recessive; *Atrypella* sp. common, other brachiopods and trace fossils rare	14.2	196.7
43	**Limestone:** argillaceous, medium grey, medium bedded, wavy to nodular; **lime mudstone** with minor intraclastic and shelly **floatstone**, also minor **rudstone**; *Planolites* sp., *Palaeophycus* sp. rare	10.5	182.5
42	**Limestone:** argillaceous, medium grey, medium bedded, wavy, ripple marks common; **lime mudstone** with minor shelly **floatstone**; semi-recessive, weathers with greenish tinge; *Atrypella* sp. rare, trace fossils (*Planolites* sp., *Palaeophycus* sp., *Chondrites* sp.) common	12.8	172.0
41	**Limestone:** argillaceous, medium grey, nodular; **lime mudstone** and **wackestone**; rare thin beds of intraclastic **floatstone** and crinoidal **packstone**	2.4	159.2
40	**Limestone:** as in unit 37	4.6	156.8
39	**Limestone:** argillaceous, medium grey; irregularly thin bedded; **lime mudstone**; bed of flat-pebble **conglomerate**; *Atrypella* sp. rare	1.8	152.2
38	Covered interval	5.0	150.0
37	**Limestone:** highly argillaceous, medium grey, medium bedded, wavy and nodular; **lime mudstone** with minor shelly and intraclastic **floatstone**; unit weathers with greenish tinge (this weathering colour is characteristic of most of the Douro Formation); recessive; *Atrypella* sp. common	9.0	145.4
36	**Limestone:** argillaceous, medium grey, medium bedded; alternating nodular **wackestone** and wavy bedded lime **mudstone**; semi-resistant; *Atrypella* sp. common, trace fossils common	10.5	136.4

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
35	**Limestone:** highly argillaceous, medium grey, medium bedded, wavy bedding planes, ripple marks and prod marks common; **lime mudstone** with minor brachiopod **rudstone** and flat-pebble **conglomerate;** recessive; brachiopods common, trace fossils abundant	5.7	125.9
34	**Limestone:** argillaceous, medium grey, medium to thick bedded, prod marks; **lime mudstone;** semi-resistant; abundant trace fossils	3.0	120.2
33	**Limestone:** argillaceous, medium grey, medium bedded, wavy to nodular, ripple marks, prod marks; **lime mudstone** with minor shelly **float-** and **packstone;** rare flat-pebble **conglomerate;** recessive; *Atrypella* sp. and other brachiopods rare, trace fossils (*Planolites* sp., *Scolithus* sp., *Chondrites* sp. and others) abundant	4.1	117.2
32	**Limestone:** dolomitic, medium grey-buff, thick bedded, wavy bedding; skeletal **wackestone,** at base intraclastic **floatstone** with skeletal **packstone** matrix; resistant; *Atrypella* sp. and other brachiopods rare	3.0	113.1
31	**Limestone:** argillaceous, medium grey, medium bedded, nodular, rare ripple marks and prod marks; **lime mudstone** with minor brachiopods and intraclastic **floatstone;** some planar bedded **calcisiltite;** recessive; *Atrypella* sp. and other brachiopods common, *Syringopora* sp. rare, trace fossils varied and abundant	6.3	110.1
30	**Limestone:** argillaceous, medium grey, medium bedded, wavy to nodular; **lime mudstone,** minor skeletal **wackestone;** semi-resistant; brachiopods rare, *Chondrites* sp. common	4.8	103.8
29	**Limestone:** argillaceous, medium grey, thick bedded, wavy bedding; **lime mudstone;** lenses of brachiopod and intraclastic **floatstone;** resistant; *Atrypella* sp. rare	7.0	99.0
28	**Limestone:** argillaceous, medium grey, thick bedded, nodular; **lime mudstone,** lenses of brachiopod and intraclastic **floatstone;** recessive; *Planolites* sp. and *Chondrites* sp. common	2.3	92.0
27	**Limestone:** argillaceous, medium grey, medium bedded, wavy bedding planes; lime **mudstone;** minor intraclastic **floatstone;** semi-recessive; rare *Favosites* sp., crinoid fragments and brachiopods (GSC loc. C-77455, conodonts)	5.4	89.7
26	**Limestone:** very argillaceous, medium grey, thick bedded, nodular; **lime mudstone;** minor intraclastic **floatstone;** recessive; rare brachiopods	6.0	84.3
25	**Limestone:** dolomitic and argillaceous, medium grey, medium bedded, wavy bedding planes; **lime mudstone;** resistant	1.5	78.3
	Total thickness of Douro Formation: 138.5 m		
	CAPE STORM FORMATION (SILURIAN)		
24	**Limestone:** as in unit 21	0.4	76.8
23	**Limestone:** argillaceous, medium grey, medium bedded, wavy bedding; **lime mudstone;** resistant	3.5	76.4
22	**Limestone:** medium grey, massive; biostromal **rudstone;** *Favosites* sp., hemispherical and spherical stromatoporoids, dendroid rugosans, brachiopods	1.6	72.9
21	**Limestone:** dolomitic, light grey-buff, thin bedded, internal silty lamination; **calcisiltite;** semi-resistant	2.6	71.3

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
20	**Limestone:** dolomitic and argillaceous, medium grey, thick bedded, nodular; **lime mudstone;** thin interbeds of brachiopod **floatstone;** weathers light greenish grey, semi-recessive; *Atrypella* sp., very rare, *Protathyris* sp. common (GSC loc. C-77452, conodonts)	5.3	68.7
19	**Limestone:** medium grey, thin bedded; gastropod **wackestone** passing upward into **floatstone;** resistant (GSC loc. C-77100, conodonts)	2.3	63.4
18	**Limestone:** medium grey, medium to thick bedded; **lime mudstone;** orthocones common	2.4	61.1
17	**Limestone:** medium grey, medium to thick bedded; biostromal **boundstone** with skeletal **wackestone** matrix; resistant; *Favosites* sp., spherical and tabular stromatoporoids abundant, *Atrypella* sp. very rare; fossils form up to 85% of rock (GSC loc. C-77099, conodonts)	5.5	58.7
16	**Limestone:** silty, very light grey, medium bedded with internal lamination; **lime mudstone;** semi-resistant; *Favosites* sp. rare	0.5	53.2
15	**Limestone:** very silty and dolomitic, medium grey, thin bedded; **lime mudstone;** semi-resistant *Leperditia* sp. rare	0.8	52.7
14	**Limestone:** argillaceous and silty, medium grey, medium bedded, wavy to nodular; **lime mudstone,** rare gastropod **floatstone;** semi-recessive (GSC loc. C-77098, conodonts)	2.3	51.9
13	**Limestone:** medium grey, medium bedded with internal lamination; **calcisiltite;** semi-resistant	2.2	49.6
12	**Limestone:** interbedded with **siltstone;** as in unit 1	6.9	47.4
11	**Dolomite:** highly calcareous, medium grey-buff, thin bedded; (?)detrital **dolosiltite;** single thin bed of gastropod **floatstone**	0.4	40.5
10	**Limestone:** slightly dolomitic, medium grey-brown; very thin, irregular bedding; hardground near top; **lime mudstone;** semi-resistant; rare, small stromatoporoid fragments	2.3	40.1
9	**Limestone:** interbedded with **siltstone;** as in unit 1; abundant ripple marks and load structures; hardground at top of unit; minor gastropod **floatstone**	7.6	37.8
8	**Limestone:** silty, medium grey, medium bedded; biostromal **float-** and **rud-stone** with shelly and pelletoidal **packstone** and **wackestone;** fossils form 65% of rock; resistant; stromatoporoids and *Favosites* sp. abundant (GSC loc. C-77097, conodonts)	2.1	30.2
7	**Limestone interbedded with siltstone:** as in unit 1; minor gastropod **floatstone**	7.7	28.1
6	**Limestone:** dolomitic, medium grey brown, very thin bedded, silty laminae; **lime mudstone;** semi-resistant; abundant orthocones at base	0.5	20.4
5	**Siltstone:** as in unit 1; interbedded with **dolomite,** highly calcareous, silty, medium grey, thin to very thin bedded, ripple marks, small-scale cross-lamination, **dolosiltite;** rare stromatolites	5.5	19.9
4	**Limestone:** medium grey; single bed; gastropod **rudstone,** well sorted (±4 mm) shells; semi-resistant	0.2	14.4
3	**Siltstone:** interbedded with **limestone;** similar to unit 1	7.1	14.2
2	**Dolomite:** calcareous, medium grey, thin bedded with internal silty laminae, hardground and **calcarenite** at top; **dolosiltite;** minor cryptalgal lamination; semi-resistant (GSC loc. C-77095, thin section, Fig. 62)	2.1	7.1

Unit	Description	Thickness in metres	Total from base
1	**Limestone:** dolomitic, medium grey, very thin bedded, ripple marks, cross-lamination; **lime mudstone;** interbedded with **siltstone,** calcareous and very argillaceous, laminated; leperditiids abundant	5.0	5.0

Measured thickness of Cape Storm Formation: 76.8 m

COMPOSITE STRATIGRAPHIC SECTION I, EREBUS BAY AREA

Formation	Loc. No.	Description	Field Interval
Barlow Inlet	44	Narbonne	76.3-207.8
	43	Narbonne	0.0-116.3

Unit	Description	Thickness in metres	Total from base
	BARLOW INLET FORMATION (SILURIAN) Upper member		
45	**Limestone:** dolomitic, medium grey; medium bedded with irregular, dolomitic, very thin bedding; trace fossils common; **lime mudstone** with minor crinoidal debris; *Atrypella* sp. abundant, cerioid and solitary rugose corals rare, *Palaeophycus* sp. common (GSC loc. C-79669, conodonts; C-79670, brachiopods from basal metre of unit)	4.5	247.8
44	Covered interval	7.5	243.3
43	**Limestone:** dolomitic, medium grey; thick bedded with irregular, dolomitic, very thin bedding; trace fossils common; **lime mudstone;** *Atrypella* sp. common, cerioid and solitary rugose corals rare, *Palaeophycus* sp. and *Planolites* sp. common (GSC loc. C-79668, brachiopods)	13.5	235.8
42	**Limestone:** dolomitic, medium grey; thick bedded with irregular and lenticular, very thin bedding; **lime mudstone;** *Atrypella* sp. rare, cerioid rugose corals rare to common	7.5	222.3
41	**Limestone:** medium grey, thick bedded; lime **mudstone** and skeletal **wackestone;** weathers to thin slabs; oriented red gastropods	4.0	214.8
40	**Limestone:** dolomitic, medium grey; medium bedded with irregular dolomitic laminae; trace fossils common; **lime mudstone;** *Atrypella* sp. and gastropods rare, *Chondrites* sp. and *Planolites* sp. common	6.8	210.8
39	**Limestone:** dolomitic, medium grey, labyrinthine mottling, single bed; **lime mudstone**	1.0	204.0
38	**Limestone:** dolomitic, medium grey, medium to thick bedded, irregular and discontinuous dolomitic lamination; **lime mudstone;** rare thin beds of intraclastic and brachiopod **rudstone;** *Atrypella* sp. and gastropods rare (GSC loc. C-79666, brachiopods from uppermost metre)	11.5	203.0
37	**Limestone:** dolomitic, medium grey; thick bedded with very thin, irregular and lenticular dolomitic bedding; abundant trace fossils; **lime mudstone** with 5-10% intraclastic **floatstone** as in unit 21; rare tabulate and rugose colonial corals, rare *Atrypella* sp., *Chondrites* sp., *Planolites* sp., *Palaeophycus* sp., *Scolithus* sp. (GSC loc. C-79664, brachiopods, 3 m above base of unit)	4.5	191.5

Unit	Description	Thickness in metres: Unit	Total from base
36	**Limestone:** dolomitic, medium grey; thick bedded with irregular dolomitic lamination; trace fossils common; **lime mudstone** with 5-10% intraclastic **floatstone** with shelly **packstone** matrix (flat-pebble **conglomerate**); rare gastropods, rare *Atrypella* sp. in small lenticular accumulations, *Planolites* sp., *Palaeophycus* sp., *Chondrites* sp. (GSC loc. C-76992, brachiopods, 1 m above base of unit; C-79663, thin section, Fig. 63)	8.0	187.0
35	**Limestone:** medium grey, thick bedded; shelly crinoidal and intraclastic **wackestone** and **floatstone;** abundant club-shaped SH stromatolites at top of unit	1.5	179.0
34	**Limestone:** dolomitic, medium grey; thick bedded with irregular, very thin dolomitic beds; **lime mudstone** with lenses of skeletal **wackestone,** skeletal **packstone** and brachiopod **floatstone;** rare corals, *Atrypella* sp. rare to common	3.4	177.5
33	**Limestone:** dolomitic, medium grey; thick bedded with very thin dolomitic beds; **lime mudstone;** uppermost bedding surface is hardground	3.3	174.1
32	Covered interval	2.4	170.8
31	**Limestone:** medium grey, single bed; stromatoporoids and oncolites common	1.5	168.4
30	**Limestone:** silty, dolomitic, light to medium grey, very thin bedded with internal lamination, parallel ripple marks, desiccation cracks; **calcisiltite**	3.6	166.9
29	**Limestone:** light grey; single bed; skeletal **packstone**	0.6	163.3
28	**Limestone:** medium grey, very thin bedded, desiccation cracks; **lime mudstone;** interlaminated with argillaceous **dolomite;** ostracodes and SH stromatolites common	3.0	162.7
27	**Limestone:** medium grey, very thin bedded; **lime mudstone;** rare brachiopods	2.6	159.7
26	**Limestone:** light grey, single bed; stromatolitic **boundstone;** closely spaced SH stromatolites (0.3 m high, 0.2 m diameter)	0.3	157.1
25	**Limestone:** light to medium grey-buff, single bed; intraclast **grainstone,** fine **calcirudite** (GSC loc. C-79659, conodonts)	0.5	156.8
24	**Limestone:** silty, dolomitic, medium grey; very thin bedded with internal silty and micaceous lamination, parallel ripple marks, desiccation polygons; rare trace fossils; **calcisiltite,** trace pelletal **grainstone**	4.3	156.3
23	**Limestone:** medium grey-brown, thick bedded; **lime mudstone**	1.5	152.0
22	**Limestone:** medium grey, very thin bedded; **lime mudstone;** interbedded with dolomitic, very argillaceous **mudstone;** synaeresis cracks, small-scale planar crossbeds, rare ripple marks; various trace fossils common, ostracodes locally abundant, gastropods rare	10.2	150.5
21	Covered interval	24.0	140.3
20	**Limestone:** dolomitic, medium grey, very thick irregular bedding, irregular partings, mottled; **lime mudstone** with minor lenses of crinoidal **wackestone;** resistant; *Favosites* sp. *Streptelasma* sp. and stromatoporoids rare; unit largely inaccessible, thickness estimated	12.0	116.3
19	**Limestone:** medium grey-buff, thick bedded to massive; complex of small bioherms and crinoidal **grain-** and **pack-stone;** abundant fossils in bioherms (stromatoporoids, *Favosites* sp. and heliolitiids common; phaceloid and cerioid rugosans, *Streptelasma* sp., *Frammia* sp. and crinoids rare); thickness of unit not uniform laterally	3.0	104.3
18	**Dolomite:** calcareous, very light grey, very thin bedded; **dolosiltite**	1.9	101.3

Unit	Description	Thickness in metres: Unit	Total from base
17	**Limestone:** as in unit 15	4.3	99.4
16	**Limestone:** as in unit 12	0.8	95.1
15	**Limestone:** silty, dolomitic, medium grey, thin bedded with internal lamination, rare ripple crosslamination; **calcisiltite;** rare trilobites, rare *Planolites* sp. and *Scolithus* sp.	2.9	94.3
14	**Limestone:** as in unit 12; trilobites (*Frammia* sp.) and brachiopods common	1.2	91.4
13	**Limestone:** medium grey-buff, thin bedded, locally mottled; skeletal **wackestone;** interbedded with dolomitic **calcisiltite,** silty lamination; abundant **chert;** *Frammia* sp. rare	2.9	90.2
12	**Limestone:** dolomitic, medium grey, thick bedded; **lime mudstone;** rare skeletal fragments	1.3	87.3
11	**Limestone:** dolomitic, medium grey, very thick bedded, wavy internal bedding; **lime mudstone** with minor thin interbeds of crinoidal **wackestone** and **packstone;** rare trilobites and crinoid fragments, *Streptelasma* sp.	8.6	86.0
10	Covered interval	25.5	77.4
9	**Limestone:** dolomitic, medium grey, thick bedded, nodular; **lime mudstone** and **wackestone;** abundant **chert;** rare fossils, corals, stromatoporoids, orthocones and crinoid fragments	6.9	51.9
8	**Limestone:** dolomitic, medium grey-buff; medium bedded with internal thin wavy to lenticular bedding; crinoidal **wackestone;** abundant **chert;** interbedded with minor crinoidal **grainstone** as in unit 2; rare solitary, cerioid and phaceloid rugosans, heliolitiids, *Favosites* sp., *Atrypa* sp., *Frammia* sp.	3.2	45.0
7	Covered interval	3.0	41.8
6	**Limestone:** dolomitic, medium grey, thick bedded, nodular, crossbeds in **grainstone; lime mudstone** with lenses of crinoidal **grain-** and **pack-stone;** rare solitary and phaceloid rugosans, *Favosites* sp.	9.5	38.8
5	**Limestone:** argillaceous and dolomitic, medium grey, medium bedded; wavy, lenticular internal bedding; recessive	7.3	29.3
4	**Limestone:** dolomitic, medium to dark grey, very thick bedded; interbedded with small bioherms of coralline **boundstone;** various fossils abundant in bioherms	7.8	22.0
3	**Limestone:** argillaceous and dolomitic, medium grey, thick bedded, nodular; **lime mudstone** with minor crinoidal **grainstone;** passes laterally into crinoidal **grainstone**	4.5	14.2
2	**Limestone:** light buff, thick bedded; well sorted crinoidal **grainstone;** unit wedge shaped	1.4	9.7
1	**Limestone:** dolomitic, slightly argillaceous, light to medium grey, medium bedded; complex unit of small bioherms with intervening crinoidal **grainstone** and **wackestone**	8.3	8.3

Measured thickness of Barlow Inlet Formation: 247.8 m

STRATIGRAPHIC SECTION 3, BEECHEY ISLAND

Formation	Loc. No.	Description	Field Interval
Barlow Inlet	45	Narbonne	0.0-196.4

Unit	Description	Thickness in metres	Total from base
	BARLOW INLET FORMATION (SILURIAN) Upper member		
39	**Limestone:** medium grey-buff; skeletal **wackestone,** biostromal; abundant *Favosites* sp. and stromatoporoids	1.0	196.4
38	Covered interval	1.5	195.4
37	**Limestone:** medium grey-buff, thick bedded; skeletal **wackestone,** biostromal; stromatoporoids (30% of rock volume) abundant, *Favosites* sp. common	2.9	193.9
36	**Limestone:** as in unit 25; interbedded with **limestone** as in unit 32; interbedding on 0.2 - 0.4 m scale; rare *Polarichnus* sp.	2.1	191.0
35	Covered interval	1.5	188.9
34	**Limestone:** as in unit 32	1.5	187.4
33	Covered interval	1.8	185.9
32	**Limestone:** dolomitic, medium grey; thin bedded, wavy to lenticular; **lime mudstone;** *Planolites* sp. and *Chondrites* sp. common	0.9	184.1
31	Covered interval	1.2	183.2
30	**Limestone:** as in unit 25	1.0	182.0
29	**Limestone:** dolomitic, medium to dark grey, thick bedded, wavy; **lime mudstone** with minor skeletal **wackestone;** ostracodes and gastropods common, *Planolites* sp. and *Chondrites* sp. common	2.0	181.0
28	Covered interval	2.6	179.0
27	**Limestone:** dolomitic, medium grey, thick bedded, wavy internal bedding; **lime mudstone** with minor gastropod **floatstone;** *Planolites* sp. common, gastropods common, leperditiids rare	5.2	176.4
26	Covered interval	2.7	171.2
25	**Limestone:** silty, medium grey, very thin bedded with internal lamination, abundant desiccation polygons, parallel ripple marks; **calcisiltite**	2.4	168.5
24	**Limestone:** as in unit 22; unit forms top of cliffs	10.0	166.1
23	**Limestone:** dolomitic, medium grey, thick bedded, wavy internal bedding; **lime mudstone** with minor gastropod **floatstone;** rare *Bifungites* sp., *Chondrites* sp.	1.5	156.1
22	**Limestone:** dolomitic, medium grey, medium to thick bedded, wavy internal bedding; **lime mudstone**	17.0	154.6
21	**Limestone:** medium to dark grey, thin bedded; **lime mudstone;** thin, dolomitic, argillaceous seams; rare vugs with sparite; ostracode and gastropod fragments rare (GSC loc. C-77499, conodonts)	6.0	137.6
20	**Limestone:** medium grey; very thin bedded; **lime mudstone;** silty **shale** partings	4.5	131.6

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
19	**Limestone:** dolomitic, medium grey, thin bedded, desiccation cracks common; **calcisiltite;** some beds intensively burrowed	6.9	127.1
18	**Limestone:** as in unit 16	4.0	120.2
17	**Limestone:** medium grey, irregular thin to medium bedded; **lime mudstone**	1.5	116.2
16	**Limestone:** argillaceous and dolomitic, medium grey, thick bedded, wavy internal bedding planes; **lime mudstone** with minor gastropod, brachiopod and intraclastic **rudstone;** gastropods, leperditiids, and *Atrypella* sp. rare	8.0	114.7
15	**Limestone:** dolomitic, medium grey, medium bedded, internal wavy bedding; **lime mudstone**	3.0	106.7
14	Covered interval	1.5	103.7
13	**Limestone:** argillaceous and dolomitic, medium grey, medium bedded, wavy internal bedding; **lime mudstone;** rare gastropods and leperditiids	3.9	102.2
12	**Limestone:** silty, light buff, thin to very thin bedded, small-scale planar crossbeds common; skeletal-pelletal **grainstone,** very fine **calcarenite;** weathers with reddish tinge	1.0	98.3
11	**Limestone:** dolomitic and argillaceous, medium grey, thick bedded, wavy lenticular internal bedding; **lime mudstone** with minor gastropod and brachiopod **rudstone;** *Atrypella* sp. rare to common, leperditiids, gastropods and corals rare	11.5	97.3
10	**Limestone:** dolomitic, medium grey, thick bedded; wavy, thin, internal bedding; **lime mudstone** with minor gastropod **floatstone;** *Atrypella* sp. and gastropods common, leperditiids rare	4.2	85.8
9	**Limestone:** dolomitic and argillaceous, medium grey, medium bedded; internal, thin, wavy bedding; **lime mudstone** with minor *Atrypella* sp. **rudstone;** rare gastropod **rudstone** and intraclastic **floatstone** (GSC loc. C-77495, 3 m above base, brachiopods; C-77496, 13.5 m above base, brachiopods)	23.5	81.6
8	**Limestone:** dolomitic, medium grey, medium to thick bedded, nodular; **lime mudstone** with rare shelly and intraclastic **rudstone;** *Atrypella* sp. and large leperditiids common, various corals and orthocones rare	6.5	58.1
7	**Limestone:** dolomitic, medium grey, medium bedded; thin, wavy, internal bedding; **lime mudstone,** rare flat-pebble **conglomerate;** *Atrypella* sp. common, very large leperditiids and *Favosites* sp. rare (GSC loc. C-77491, basal 0.5 m, brachiopods; C-77492, uppermost 0.5 m, brachiopods)	4.8	51.6
6	**Limestone:** dolomitic, medium grey, massive, very thin to lenticular internal bedding; **lime mudstone;** very rare beds of brachiopod **floatstone;** *Atrypella* sp. and gastropods common, *Hemiarges* sp. and cerioid corals rare	35.5	46.8
5	**Limestone:** medium grey, very thin bedded; crinoidal and skeletal **packstone** at base, **wackestone** in upper part; **calcarenite** (GSC loc. C-77489, conodonts)	0.4	11.3
4	**Limestone:** medium grey; single bed; biostromal **boundstone;** bryozoans form about 70% of rock; *Favosites* sp. common	0.5	10.9
3	**Limestone:** dolomitic, medium grey, medium bedded; wavy, thin, internal bedding; **lime mudstone;** minor **wackestone**	7.5	10.4
2	**Limestone:** medium grey, very thin bedded; skeletal **wackestone,** biostromal; hemispherical and spherical stromatoporoids and cerioid rugosans abundant, *Favosites* sp. and *Alveolites* sp. common, *Streptelasma* sp. rare	1.4	2.9

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
1	**Limestone:** medium grey; very thin, irregularly bedded; **lime mudstone,** passing upward into crinoidal **wackestone** (GSC loc. C-77487, conodonts).	1.5	1.5

STRATIGRAPHIC SECTION K, DRAGLEYBECK INLET AREA

Formation	Loc. No.	Description	Field Internal
Devon Island	49	Thorsteinsson	18.8-111.6
Douro	49	Thorsteinsson	0.0-18.8

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	DEVON ISLAND FORMATION (SILURIAN)		
8	**Limestone:** variably argillaceous, medium grey, thin bedded, irregular bedding planes; **lime mudstone**	10.7	111.6
7	**Limestone** and **shale:** as in unit 4	24.4	100.9
6	**Limestone** and **shale:** as in unit 4; very irregular bedding planes; thick bed of bioclastic **limestone** (very slightly silty, burrowed, in part **calcisiltite,** brachiopods, sponge spicules) forms top of unit	3.0	76.5
5	**Limestone** and **shale:** as in unit 4; shale about 10% of unit; bed of skeletal **grainstone** (loosely packed **calcirudite,** crinoid fragments, brachiopods, phosphatic fragments, calcareous algae) forms top of unit	35.1	73.5
4	**Limestone:** argillaceous, medium grey, very thin to thin bedded, internal lamination, in part burrowed; **lime mudstone** with rare **calcisiltite,** rare quartz, mica and feldspar, pelletal **grainstone** in burrows; rhythmically interbedded and interlaminated with **shale,** calcareous, medium grey, fissile; sponge spicules	19.8	38.4
	Measured thickness of Devon Island Formation: 92.8 m		
	DOURO FORMATION (SILURIAN)		
3	**Limestone:** as in unit 1; unfossiliferous (GSC loc. C-74432, conodonts)	0.2	18.8
2	**Limestone:** argillaceous, medium grey, thin bedded, internal lamination, weathers rubbly	10.7	18.6
1	**Limestone:** argillaceous, slightly dolomitic, medium to dark grey, thin to medium bedded, irregular bedding planes, dolomitic mottles; **lime mudstone** with minor skeletal **wackestone;** colonial corals	7.9	7.9
	Measured thickness of Douro Formation: 18.8 m		

COMPOSITE STRATIGRAPHIC SECTION L, GRIFFIN INLET AREA

Formation	Loc. No.	Description	Field interval
Sophia Lake	47	Thorsteinsson	38.8-70.5
Barlow Inlet	47	Thorsteinsson	0.0-38.8
	55	Thorsteinsson	0.0-60.9

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
	SOPHIA LAKE FORMATION (LOWER DEVONIAN)		
	Overlying rocks not exposed		
20	**Dolomite** and **limestone:** interbedded, thin to medium bedded; **dolomite,** calcareous, light grey to light brownish-grey, finely crystalline; **limestone,** dolomitic and silty, light olive-grey to light brownish grey, labyrinthine mottling, poor, vuggy porosity; **lime mudstone**	4.3	131.3
19	**Limestone:** dolomitic and silty, light olive-grey to brownish grey, very thin bedded, nodular; **lime mudstone** to skeletal **wackestone;** gastropods, ostracodes (GSC loc. C-79497, conodonts, 18.5 m above base of formation)	10.7	127.0
18	**Dolomite:** calcareous and silty, light grey to greenish grey, finely crystalline, very thin to thin bedded; soft weathering; 50% covered	16.7	116.3
	Measured thickness of Sophia Lake Formation: 31.7 m		
	BARLOW INLET FORMATION (SILURIAN-DEVONIAN) Upper member		
17	**Dolomite:** calcareous, light grey, finely crystalline, thin to medium bedded, some beds mottled with **limestone**	3.0	99.6
16	**Limestone:** light grey, medium bedded, fenestral lamination; pelletoidal **grainstone**	1.5	96.6
15	**Dolomite:** light grey, finely crystalline, medium bedded, irregularly bedded	2.1	95.1
14	**Dolomite:** calcareous, light grey, finely crystalline, massive	1.0	93.0
13	**Limestone:** as in unit 8	6.3	92.0
12	**Limestone** and **shale:** interbedded, dark grey; **limestone,** thin bedded, zones of ostracode debris; **shale,** calcareous, fissile	0.5	85.7
11	**Dolomite:** light olive-grey, finely crystalline, thin to medium bedded	0.5	85.2
10	**Dolomite:** light olive-grey, finely crystalline, medium bedded	0.6	84.7
9	Covered interval	3.4	84.1
8	**Limestone** and **dolomite:** interbedded, very thin to thin bedded; **limestone,** various shades of brown and grey, labyrinthine mottling; **dolomite,** light olive-grey, finely crystalline	12.2	80.7
7	**Limestone:** dolomitic, brownish grey, medium to thick bedded, labyrinthine mottling; **lime mudstone** with minor (?)skeletal debris; sparse corals and stromatoporoids	7.1	68.5
6	**Limestone:** dolomitic, light grey, very thin bedded to laminated; **lime mudstone;** leperditicopid ostracodes	0.5	61.4

Unit	Description	Thickness in metres: Unit	Total from base
5	**Limestone:** dolomitic, light grey to medium light grey, very thin to medium bedded; **lime mudstone**	3.0	60.9
4	**Limestone:** dolomitic, medium light grey, thin to medium bedded, minor beds with labyrinthine mottling; **lime mudstone;** gastropods and leperditicopid ostracodes throughout	7.6	57.9
3	**Limestone:** dolomitic, medium light grey, thick bedded to massive, minor amounts of beds with labyrinthine mottling; skeletal-pelletoidal **wackestone;** sparse solitary and colonial corals, ostracodes and gastropods	15.8	50.3
2	**Limestone:** medium grey, thick bedded; crinoidal **packstone**	1.0	34.5
1	**Limestone:** in part dolomitic, medium grey to brownish grey, thin to medium bedded, irregular bedding planes, minor labyrinthine mottling; **lime mudstone**	33.5	33.5
	Underlying beds - covered interval in Barlow Inlet Formation		

STRATIGRAPHIC SECTION M, McCORMICK BAY AREA

Formation	Loc. No.	Description	Field Interval
Sophia Lake	48	Narbonne	0.0-99.0

Unit	Description	Thickness in metres: Unit	Total from base
	SOPHIA LAKE FORMATION (DEVONIAN)		
	Overlying part of section inaccessible		
41	**Limestone:** medium grey-buff, medium bedded; **lime mudstone;** resistant	5.6	99.0
40	**Dolomite:** as in unit 34; minor thin interbeds of **dolomite** as in unit 21; recessive	17.6	93.4
39	**Dolomite:** calcareous, medium grey-buff, thin to medium bedded; **dolosiltite;** resistant	3.7	75.8
38	**Limestone:** as in unit 33; very thin bedded in middle part of unit	2.7	72.1
37	**Dolomite:** as in unit 34; locally weathers reddish	5.8	69.4
36	**Dolomite:** light grey, laminated; **dolosiltite;** recessive, friable	1.5	63.6
35	**Limestone:** medium grey-buff, medium bedded; **lime mudstone;** resistant	1.4	62.1
34	**Dolomite:** silty, light to medium bluish grey, massive; **dolosiltite** grading into **siltstone;** recessive	2.3	60.7
33	**Limestone:** slightly dolomitic, medium buff-brown, thin to medium bedded, mottled; **lime mudstone;** minor interbeds of flat-pebble **conglomerate;** rare leperditicopid ostracodes	2.0	58.4
32	**Dolomite:** as in unit 17	0.6	56.4

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
31	**Dolomite:** calcareous, silty, medium grey-buff, very thin bedded with silty lamination; **dolosiltite;** semi-recessive	1.6	55.8
30	**Dolomite:** slightly calcareous, light to medium grey, very thin bedded; **dolosiltite;** recessive	0.3	54.2
29	**Dolomite:** as in unit 17	0.4	53.9
28	**Dolomite:** as in unit 21; very thin to thin bedded	1.5	53.5
27	**Dolomite:** as in unit 20; unit poorly exposed	4.7	52.0
26	**Dolomite:** as in unit 21; very thin bedded	1.0	47.3
25	**Dolomite:** as in unit 20; thin bedded toward top; rare, very thin interbeds as in unit 21	3.1	46.3
24	**Dolomite:** medium grey, thin bedded; **dolosiltite;** semi-recessive	0.2	43.2
23	**Dolomite:** as in unit 21; rare, very thin beds with granule-sized intraclasts; recessive	2.9	43.0
22	**Dolomite:** as in unit 20	1.8	40.1
21	**Dolomite:** medium buff-brown, thin bedded with internal lamination, rare bird's-eye structures; detrital **dolosiltite,** clay cement, rare quartz grains; semi-recessive (GSC loc. C-79674, thin section, Fig. 72)	0.2	38.3
20	**Dolosiltite:** as in unit 1, dark grey, massive, recessive	4.6	38.1
19	**Limestone:** slightly dolomitic, medium grey-brown, very thin bedded; **lime mudstone;** gradational base; resistant	3.0	33.5
18	**Limestone:** medium buff-brown, medium bedded; skeletal **wackestone** and **packstone;** erosional base; in middle part of unit minor nodular dolomitic **lime mudstone;** resistant (GSC loc. C-79673, conodonts)	3.3	30.5
17	**Dolomite:** dark grey, thin bedded; **dolosiltite;** resistant, weathers medium buff	0.7	26.1
16	**Dolomite:** silty, light buff, thin bedded with internal silty lamination; **dolosiltite;** semi-recessive	0.7	26.1
15	**Limestone:** very dolomitic, medium grey, thin bedded with internal lamination, desiccation polygons; **lime mudstone;** semi-resistant, weathers grey-buff	0.4	25.4
14	**Dolomite:** very silty, dark grey; very poorly developed, thin bedding; detrital **dolosiltite,** micaceous, rare chlorite and feldspar; recessive	0.4	25.0
13	**Dolomite:** medium buff, very thin to thin bedded, internal lamination; detrital **dolosiltite;** semi-recessive	0.8	24.6
12	**Limestone:** medium grey, medium bedded, abundant bird's-eye structures; **lime mudstone;** semi-resistant, weathers grey-buff	1.8	23.8
11	**Dolomite:** silty, light to medium buff, thin bedded with internal silty lamination; **dolosiltite;** recessive	2.0	22.0
10	**Dolomite:** slightly calcareous, medium grey, very thin bedded; **dololutite** to **dolosiltite;** semi-resistant	1.3	20.0
9	**Dolomite:** medium grey, very thin bedded; **dolosiltite;** minor interbeds of dolomitic **siltstone;** recessive, weathers yellow-buff	1.0	18.7

Unit	Description	Thickness in metres: Unit	Thickness in metres: Total from base
8	**Dolomite:** medium grey brown, laminated; **mudstone**	1.7	17.7
7	**Limestone:** as in unit 4	3.0	16.1
6	**Limestone:** as in unit 2	1.5	13.0
5	**Dolomite:** highly calcareous, medium grey-buff, laminated; **dolosiltite;** recessive	1.6	11.5
4	**Limestone:** medium grey, very thin bedded; **calcisiltite;** semi-resistant	0.9	9.9
3	**Dolomite:** slightly calcareous, very light grey, very thin bedded with fine internal lamination, contorted bedding common; **dolosiltite**	0.3	9.0
2	**Limestone:** slightly dolomitic, medium grey, thin to medium bedded, erosional base; skeletal **wackestone,** debris very fine sand sized; semi-resistant, weathers with brownish tinge (GSC loc. C-77198, conodonts)	3.4	8.7
1	**Dolomite:** slightly silty and calcareous, light to medium grey, thin bedded with internal lamination, some contorted bedding; detrital **dolosiltite;** rare calcite cement, rare pelletoids; weathers grey-brown, mostly recessive.	5.3	5.3

Underlying beds not exposed

Measured thickness of Sophia Lake Formation: 99.0 m

APPENDIX III

ANALYSES

A. X-Ray Diffraction

Whole rock samples were analyzed by X-ray diffraction. Semi-quantitative results were obtained from diffraction peak heights. The peaks may vary with the type of mineral, its degree of crystallinity, crystal size and with any amorphous material present.

GSC Loc. Number	Formation	Loc.	Desc'd. Sec. & Unit	Calcite	Dolomite	Quartz	Feldspar	Gypsum	Montmorillonite	Mica/Illite	Chlorite	Mixed Layer Clays	Apatite	Pyrite
C-77033	Bear Point	3	$A_2$20		78	17	5							
C-77036	Cass Fjord	3	$A_1$14	1	67	24	6			2				
C-77044	Bear Point	3	$A_2$18	79	18	2	1							
C-77048	Rabbit Point	3		3		93	2						1	
C-77050	Cass Fjord	3	$A_1$20		74	18	8							
C-77057	Cass Fjord	24	B52		59	41								
C-77063	Cass Fjord	24	B80		92	5	3							
C-77070	Baumann Fiord	27	B128	tr	39	9		tr	49	2				
C-77077	Bay Fiord	31	B242		63	22	6	8						1?
C-77145	Blanley Bay	8	$A_1$77		83	6	1			1				
C-77208	Cass Fjord	18	D76		16	83	1							
C-77258	Blanley Bay	2		1	91	7	1							
C-77305	Cass Fjord	3	$A_1$25		63	20	16			1				
C-77306	Cass Fjord	3	$A_1$28		pr	3?	97?							
C-77307	Cass Fjord	3	$A_1$32		90	9	1							
C-77332	Strathcona Sound	16	C3			62	23			2	13			
C-77341	Strathcona Sound	13	C14	2	4	77	14				1?			
C-77345	Strathcona Sound	13	C22			74	11			1	13	1		
C-77349	Rabbit Point	14		1	1	96	1							1
C-77350	Bear Point	14			2	93	1						2	2
C-77356	Eleanor River	6	$A_1$129	78	16	6								
C-77359	Bay Fiord	6	$A_1$137		10	90								
C-77360	Bay Fiord	6	$A_1$143	1	93	6								
C-77363	Bay Fiord	6	$A_1$155	34	53	7	1			2	3			
C-77396	Blanley Bay	26			93	5	2							
C-77399	Blanley Bay	26		2	83	2		12						
C-77410	Bay Fiord	19	E36		pr	4?		96?						
C-77411	Bay Fiord	19	E50		79	14	2			4				
C-85282	Sophia Lake	56		78	11	6	3			2				
C-85283	Sophia Lake	56			57	33	4			4	2			
C-85284	Sophia Lake	56		24	31	39	3			2	1			
C-85285	Sophia Lake	56		8	30	50	5			5	2			

tr = trace

pr = present

B. X-Ray Fluorescence

Elemental analysis of diabase in dyke.

(GSC loc. C-77375, locality 15)

Si_2O	41.7%	K_2O	2.63%
TiO_2	5.26	H_2	O1.5
Al_2O_3	13.7	CO_2	0.2
Fe_2O_3	3.6	P_2O_5	0.56
FeO	9.3	S	0.03
MnO	0.18	Ba	0.036
MgO	5.37	Rb	0.007
CaO	7.98	Sr	0.056
Na_2	O2.2	Zn	0.009

ISPG PHOTO NUMBERS

Figure 5 - ISPG photo 1156-55

Figure 6 - ISPG photo 1277-7

Figure 12 - ISPG photo 1277-5

Figure 13 - ISPG photo 1473-33

Figure 14 - ISPG photo 1473-34

Figure 15 - ISPG photo 1277-14

Figure 17 - ISPG photo 1474-9

Figure 18 - ISPG photo 1183-24

Figure 19 - ISPG photo 1156-155

Figure 20 - ISPG photo 1156-154

Figure 21 - ISPG photo 1156-44

Figure 22 - ISPG photo 1473-24

Figure 23 - ISPG photo 1156-60

Figure 24 - ISPG photo 1473-15

Figure 25 - ISPG photo 1473-1

Figure 26 - ISPG photo 1156-39

Figure 27 - ISPG photo 1156-27

Figure 28 - ISPG photo 1473-3

Figure 29 - ISPG photo 1473-36

Figure 30 - ISPG photo 1183-20

Figure 31 - ISPG photo 1473-17

Figure 32 - ISPG photo 1277-1

Figure 33 - ISPG photo 1243-2

Figure 34 - ISPG photo 1473-35

Figure 35 - ISPG photo 1473-16

Figure 36 - ISPG photo 1473-38

Figure 38 - ISPG photo 1156-41

Figure 39 - ISPG photo 1277-15

Figure 40 - ISPG photo 1156-35

Figure 41 - ISPG photo 1156-99

Figure 42 - ISPG photo 1473-26

Figure 43 - ISPG photo 1473-27

Figure 44 - ISPG photo 1473-28

Figure 45 - ISPG photo 1156-32

Figure 46 - ISPG photo 1473-25

Figure 47 - ISPG photo 1183-32

Figure 48 - ISPG photo 1473-22

Figure 49 - ISPG photo 1277-9

Figure 50 - ISPG photo 1156-125

Figure 51 - ISPG photo 1183-8

Figure 52 - ISPG photo 1473-23

Figure 53 - ISPG photo 1473-7

Figure 54 - ISPG photo 1473-12

Figure 55 - ISPG photo 1277-11

Figure 56 - ISPG photo 1519-17

Figure 57 - ISPG photo 1473-9

Figure 58 - ISPG photo 1156-119

Figure 59 - ISPG photo 1183-4 and 1183-5 (composite photo)

Figure 60 - ISPG photo 1183-6

Figure 62 - ISPG photo 1473-14

Figure 63 - ISPG photo 1156-79

Figure 64 - ISPG photo 1473-6

Figure 65 - ISPG photo 1347-9

Figure 66 - ISPG photo 1347-7

Figure 68 - ISPG photo 1473-11

Figure 70 - ISPG photo 1347-32

Figure 71 - ISPG photo 1347-30

Figure 72 - ISPG photo 1473-31

Figure 73 - ISPG photo 1347-28

Figure 77 - ISPG photo 1277-12

Figure 80 - ISPG photo 1183-35

Figure 81 - ISPG photo 1156-7

MAPS
NOT
FILMED

CARTES
OMISES